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Seamless flexible endless member for photosensitive body substrate - is formed using cylindrical master disposed in cathode case, and electrolytic soln. with temp. controller

Patent Assignee: RICOH KK (RICO )

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The member is mfd. using a cylindrical master (13) which is disposed concentrically within a cathodic case (16), with a spacing of 10-50 mm between them. An electrolytic solution is used, with a temp. controller.

USE/ADVANTAGE - For base of organic photosensitive body used in copier, facsimile, printer etc. Provides improved durability.

Dwg.4/7

Title Terms: SEAM; FLEXIBLE; ENDLESS; MEMBER; PHOTORESISTISER; BODY; SUBSTRATE; FORMING; CYLINDER; MASTER; DISPOSABLE; CATHODE; CASE; ELECTROLYTIC; SOLUTION; TEMPERATURE; CONTROL

Derwent Class: M11; P84; S06

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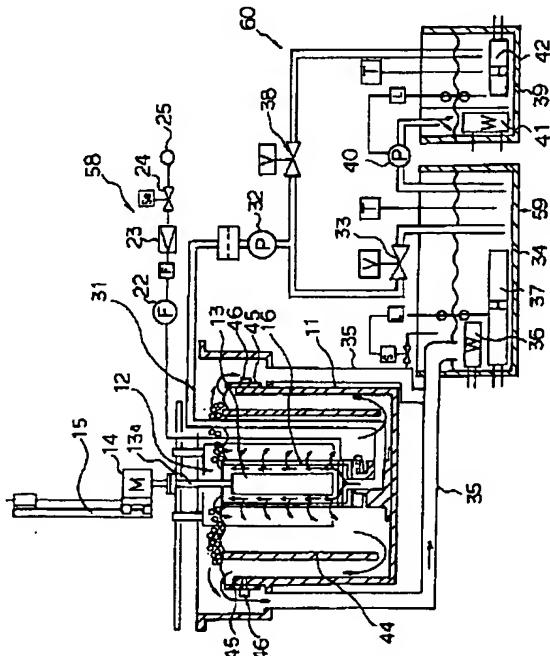
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(54)【発明の名称】 縫目なし可挠性無端状部材およびその無端状部材の製造装置

(57)【要約】

【目的】本発明は、縫目なし可挠性無端状部材およびその無端状部材の製造装置に関し、耐久性が悪化するのを防止することができるとともに、有機感光体等に使用した場合にもその機能を充分に発揮することができる縫目なし可挠性無端状部材および主層の表面に厚さ0.2~3μm、拡散反射面状態の表面粗さでRz:0.2~0.8μmの表面層を形成することができるその製造装置を提供することを目的としている。

【構成】円筒状マスター13と約10~50mm離隔して該マスター13の周囲に同軸上に配設されるとともに電鍍槽11内を陽陰極に分離する通電、液通可能な隔膜18を有するカソードケース16を設けるとともに、カソードケース16の内周下端部に供給される電鍍液の温度を調整する調整手段を設けている。



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## 【特許請求の範囲】

【請求項1】スルファミン酸ニッケル電気鋳造法によって成形され、有機感光体の基体や現像トナー搬送用スリーブ等に用いられる継目なし可撓性無端状部材において、厚さが20~40μm、硬度H<sub>v</sub>400~500、裏面粗さR<sub>a</sub>0.05~0.3μmの主層と、

その主層の表面に形成された厚さ0.2~3μm、拡散反射面状態の表面粗さでR<sub>a</sub>0.2~0.8μmの表面層と、からなることを特徴とする継目なし可撓性無端状部材。

【請求項2】請求項1記載の可撓性無端状部材の製造装置であって、

電気鋳造槽と、

該電気鋳造槽内に上下方向に延在して設けられ、表面に微小凹凸面が形成された電気鋳造用の円筒状マスターと、

該マスターと約10~50mm離隔して該マスターの周囲に同軸上に配設されるとともに電気鋳造槽内を陽陰極に分離する通電、液通可能な隔膜を有し、上部に開口部が形成された円筒状カソードケースと、

該カソードケースの内周下端部から上部開口部に向かつて電鋳液を供給可能な供給手段と、

前記カソードケース内に供給される電鋳液を空気によつて攪拌するエアーパーリング手段と、

前記カソードケース内に供給される電鋳液の温度を調整する調整手段と、を有することを特徴とする継目なし可撓性無端状部材の製造装置。

【請求項3】前記隔膜が円筒状マスターの周囲に1重に配設され、該隔膜の通気性がJIS 1cm<sup>2</sup>当り0.5~3cm<sup>3</sup>/秒に設定されることを特徴とする請求項2記載の継目なし可撓性無端状部材の製造装置。

【請求項4】前記隔膜が円筒状マスターの周囲に所定間隔離て2重に配設され、外側に配設された隔膜の通気性がJIS 1cm<sup>2</sup>当り5~10cm<sup>3</sup>/秒に設定されることを特徴とする請求項2記載の継目なし可撓性無端状部材の製造装置。

【請求項5】前記カソードケースと電気鋳造槽の間に仕切板が設けられ、

該仕切板は、上端部がカソードケースの上部開口部と同一高さになるように配設されるとともに下端部がカソードケースの下端部よりも下方に配設され、

前記電気鋳造槽の外周上端部がカソードケースの上部開口部よりも約5~15mm下方になるように形成され、該外周上端部から電鋳液を流出させるようにしたことを特徴とする請求項2~4何れかに記載の継目なし可撓性無端状部材の製造装置。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は継目なし可撓性無端状部材およびその無端状部材の製造装置に関し、詳しく述べる。

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複写機、ファクシミリ、プリンター等に用いられる有機感光体の基体等に用いられる継目なし可撓性無端状部材およびその無端状部材の製造装置に関する。

## 【0002】

【従来の技術】従来から有機感光体の基体等に用いられる継目なし可撓性無端状部材をスルファミン酸ニッケル電気鋳造法によって成形する方法としては、例えば特開平3-17289号公報、特開平3-17290号公報、特開平3-17291号公報等によって知られている。

## 【0003】

このものは、ガラスピーツを用いてホーニング加工が施されることによりR<sub>a</sub>約5mm以下の凹凸が形成された電気鋳造用マスター(金型)を使用することにより、このマスター上に電鋳スリーブを析出させるようしている。また、マスターから電鋳スリーブを抜き取る方法としては、電鋳液に圧縮応力剤としてサッカリンナトリウム等の光沢剤を加えることにより、電鋳スリーブに圧縮応力を与えてスリーブが電鋳マスターよりも10~20μm大きくなるようにしたり、加熱してマスターとスリーブとの熱膨張や収縮率を大きくすることによりスリーブとマスターとのクリアランスを大きくしたり、あるいは冷却水またはスリーブ抜き媒体を利用する等している。

【0004】このようにしてマスター上に形成された凹凸が裏面に複写された電鋳スリーブを得るようしている。また、その他に電鋳されたスリーブをマスターから抜き取った後にそのスリーブ表面に別工程で梨地メッキやセラミックス微粉末の複合メッキを施したりするようにもしている。なお、上述したように電鋳マスターに凹凸を加工する方法としては、化学エッティング、レーザ加工、研削加工あるいはラッピングペーパーによる研磨加工が行なわれており、電鋳スリーブ表面の粗さを得るために電鋳マスターの表面の凹凸を調整するようしている。

## 【0005】

【発明が解決しようとする課題】しかしながら、このような従来の電鋳スリーブ等の無端状部材にあっては、電鋳スリーブを電鋳マスターから抜き易くするためにサッカリンナトリウム等の光沢剤を加えていたため、スリーブの変形を伴う使用を繰り返したときにその耐久性が非常に悪化してしまうという問題があった。

【0006】すなわち、サッカリンナトリウム等の光沢剤を加えた場合には、スリーブを電鋳マスターから容易に抜き取ることができるが、その反面で光沢剤の影響を受けて電鋳マスター表面粗さを平滑化しようとする作用が同時に起り、スリーブ表面に必要な粗さよりも電鋳マスター表面を粗くしなければならない。具体的には、スリーブの裏面よりも表面の方向が表面粗さR<sub>a</sub>0.1~0.5μm程度細かく、光沢および平滑性を有したものとな

【0007】そして、この傾向は電鋳マスターの径がΦ40mm以下となる場合には、電鋳マスターからスリーブを容易に引き抜くためにマスターとスリーブの間のクリアランスをマスターの真直度を0とした場合に10μm以上確保する必要があるため、より圧縮応力を強くする方向になり、光沢剤の添加量をより一層増加させなければならない。

【0008】このため、電析する膜中にはイオウが多く含まれるようになり、スリーブとしての膜硬度が高くなってしまい、全体的に脆くなってしまう。この結果、スリーブの変形を伴う使用を繰り返した場合に、その耐久性が非常に悪化してしまい、有機感光体の基体やトナー搬送用のベルト等に用いられた場合にその機能を充分に発揮することができないという問題があった。

【0009】また、電鋳マスターからスリーブを容易に引き抜くには、マスター表面に形成された粗さから微小リップル成分を取り除いて平滑化することが必要であり、マスター表面を炭酸カルシウムや酸化アルミニウム等の微粉末で研磨処理する必要があるため、電鋳スリーブを得るためにコストが増大してしまうという問題があった。

【0010】そこで請求項1記載の発明は、無端状部材の主層の表面に拡散反射面状態の粗さを有した厚さ0.2～3μm程度の表面層を形成することにより、変形を伴う使用が繰り返された場合にも耐久性が悪化するのを防止することができるとともに、有機感光体やトナー搬送用ベルト等に使用した場合にもその機能を充分に発揮することができる継目なし可撓性無端状部材を提供することを目的としている。

【0011】請求項2記載の発明は、主層の表面に厚さ0.2～3μm、拡散反射面状態の表面粗さでR<sub>z</sub>0.2～0.8μmの表面層を容易に形成することができる継目なし可撓性無端状部材の製造装置を提供することを目的としている。請求項3記載の発明は、カソードケース内に電鋳液を少なく供給した場合でも、該ケースの上部開口部から電鋳液をオーバーフローさせてエアーバーリングによって発生した泡をカソードケース上部開口部から容易に流出させることができ、無端状部材の上端部分に泡が付着して該無端状部材を汚すこと等を防止することができるとともに電鋳液の供給ポンプの容量を少なくすることができる小型、低コストな継目なし可撓性無端状部材の製造装置を提供することを目的としている。

【0012】請求項4記載の発明は、請求項3記載の発明の目的に加えて、隔膜を2重構造にすることにより、内側の隔膜の内周部に供給される電鋳液と外側の隔膜外の電鋳液を分離して、内側の隔膜の内周部に供給される電鋳液の温度が引上げられないようにすることができ、拡散反射膜状態の表面粗さでR<sub>z</sub>0.2～0.8μmの表面層を形成するに必要な電鋳液の温度を充分に確保することができる継目なし可撓性無端状部材の製造装置を提供す

ることを目的としている。

【0013】請求項5記載の発明は、カソードケース内部に供給される電鋳液の温度分布を均一化させつつカソードケースの内周下端部から上部開口部に向かって電鋳液を供給することができるとともに、該ケースの上部開口部から電鋳液をオーバーフローさせてエアーバーリングによって発生した泡を電鋳液から分離して電鋳槽外に容易に流出させることができ、継目なし可撓性無端状部材の製造装置を提供することを目的としている。

【0014】

【課題を解決するための手段】請求項1記載の発明は、上記課題を解決するために、スルファミン酸ニッケル電気鋳造法によって成形され、有機感光体の基体や現像トナー搬送用スリーブ等に用いられる継目なし可撓性無端状部材において、厚さが20～40μm、硬度H<sub>v</sub>400～500、裏面粗さR<sub>z</sub>0.05～0.3μmの主層と、その主層の表面に形成された厚さ0.2～3μm、拡散反射面状態の表面粗さでR<sub>z</sub>0.2～0.8μmの表面層と、からなることを特徴としている。

【0015】請求項2記載の発明は、上記課題を解決するために、請求項1記載の可撓性無端状部材の製造装置であって、電気鋳造槽と、該電気鋳造槽内に上下方向に延在して設けられ、表面に微小凹凸面が形成された電気鋳造用の円筒状マスターと、該マスターと約10～50mm離隔して該マスターの周囲に同軸上に配設されるとともに電気鋳造槽内を陽陰極に分離する通電、液通可能な隔膜を有し、上部に開口部が形成された円筒状カソードケースと、該カソードケースの内周下端部から上部開口部に向かって電鋳液を供給可能な供給手段と、前記カソードケース内に供給される電鋳液を空気によって攪拌するエアーバーリング手段と、前記カソードケース内に供給される電鋳液の温度を調整する調整手段と、を有することを特徴としている。

【0016】請求項3記載の発明は、上記課題を解決するために、請求項2記載の発明において、前記隔膜が円筒状マスターの周囲に1重に配設され、該隔膜の通気性がJIS1cm<sup>2</sup>当り0.5～3cm<sup>3</sup>/秒に設定されることを特徴としている。請求項4記載の発明は、上記課題を解決するために、請求項2記載の発明において、前記隔膜が円筒状マスターの周囲に所定間隔隔てて2重に配設され、外側に配設された隔膜の通気性がJIS1cm<sup>2</sup>当り5～10cm<sup>3</sup>/秒に設定されることを特徴としている。

【0017】請求項5記載の発明は、上記課題を解決するために、請求項2～4何れかに記載の発明において、前記カソードケースと電気鋳造槽の間に仕切板が設けられ、該仕切板は、上端部がカソードケースの上部開口部と同一高さになるように配設されるとともに下端部がカソードケースの下端部よりも下方に配設され、前記電気鋳造槽の外周上端部がカソードケースの上部開口部よりも約5～15mm下方になるように形成され、該外周上端部

から電鋳液を流出させるようにしたことを特徴としている。

## 【0018】

【作用】請求項1記載の発明では、無端状部材が、厚さを20~40 $\mu$ m、硬度H<sub>v</sub>400~500、裏面粗さR:0.05~0.3 $\mu$ mの主層と、その主層の表面に形成された厚さ0.2~3 $\mu$ m、拡散反射面状態の表面粗さでR:0.2~0.8 $\mu$ mの表面層と、から構成される。したがって、無端状部材を複写機、ファクシミリあるいはプリンター等の搬送ベルトや有機感光体等の繰り返し変形を伴う部材として使用する場合には、スルファミン酸ニッケル電鋳造法によって成形された主層は変形を伴う使用が3万回、さらに屈曲状態が10万回以上の耐久性を有することから、この主層上に形成された表面層が主層と共に変形した場合にも耐久性が悪化することがない。

【0019】また、表面層が拡散反射面状態の表面粗さでR:0.2~0.8 $\mu$ mに設定されるので、画像形成用光書き込み光源に対して散乱面として作用し、モアレ画像、多重反射画像が形成されることはなく、良好な画像を形成することができる。また、有機感光体基体として使用する場合には、拡散反射面状態の粗さを有する表面層に感光体塗付工程でこの表面層上に塗付される下引層に対して密着が良好となり、塗付欠陥が発生しない。また、感光体の幅を最小とするために感光体塗付領域で不要な幅端部を切断した場合でも剥離が起こり難い。また、下引き層の光散乱剤を低減することができるとともに下引き層を薄くすることができる。

【0020】さらに、感光体の画像形成プロセスに適用される場合には、感光体と導電基体間がオーム性接触であることから、R:0.2~0.8 $\mu$ mの表面粗さを有する場合には表面性が拡大されることになることから、残留電位の蓄積が減少され、鮮明な画像を得ることができる。請求項2記載の発明では、電鋳造槽内に設けられ、上下方向に延在する電鋳造用の円筒状マスターと、該マスターと約10~50mm離隔して該マスターの周囲に同軸上に配設されるとともに電鋳造槽内を陽陰極に分離する通電、液通可能な隔膜を有し、上部に開口部が形成された円筒状カソードケースと、カソードケースの内周下端部に供給される電鋳液の温度を調整する調整手段と、が備えられる。

【0021】このように構成されるのは、スルファミン酸ニッケル電鋳造法によって有機感光体の基体等に用いられる離目なし可撓性無端状部材を製造する方法にあっては、通常、円筒状マスターの面の粗さ基体の裏面に複写するようになっており、その裏面粗さは、析出膜を電鋳造マスターから離型するための圧縮応力発生用の光沢剤(サッカリン)等の影響によって細かくなり、光沢面となるのを防止するためである。

## 【0022】すなわち、円筒状マスターの周囲の10~50mmの範囲の液温を所定温度に容易に調整することによ

り、液温を低下させて電鋳液の成分を変えることなしにスルファミン酸ニッケル電鋳造法によって得られた硬度H<sub>v</sub>400~500の主層に連続して表面粗さR:0.2~0.8 $\mu$ mの拡散反射膜状態の表面層を析出することができる。また、本発明では、カソードケースの下端部から上端部に向かって電鋳液を供給する供給手段およびカソードケース内に供給される電鋳液を空気によって攪拌するエアーパーリング手段が設けられるので、カソードケース内に供給される電鋳の温度が均一化され、表面層の表面粗さが容易に均一化される。

【0023】請求項3記載の発明では、隔膜が円筒状マスターの周囲に1重に配設され、該隔膜の通気性がJIS 1cm<sup>2</sup>当り0.5~3cm<sup>3</sup>/秒に設定される。このように構成されるのは、カソードケースはその内部に供給される電鋳液を円筒状マスターの下端部から上端部まで均一に配分するための適度な液通を行なうための通気性が必要であるからであり、また、カソードケース内はエアーパーリングされることによって電鋳液中の界面活性剤によって泡が発生し、この泡がカソードケース内に蓄積して飛散したり円筒状マスター上部に付着した状態で持出され、円筒状マスターを洗浄する際にこの泡が洗浄液を汚してしまうとともに洗浄液に浮遊した後に表面に再付着してしみ等が発生してしまうという不具合が発生するのを防止するためである。

【0024】すなわち、隔膜の通気性をJIS 1cm<sup>2</sup>当り0.5~3cm<sup>3</sup>/秒に設定することにより、カソードケース内に供給される液量を円筒状マスターの下端部から上端部まで均一に配分することができるとともに、電鋳液が低流量(例えば、5~20L/分:但し、Lはリットルを示す)であっても、電鋳液はカソードケースの上端部からオーバーフロー状態となり、エアーパーリングによって発生した泡をカソードケースの上端部から容易に流出させることができる。

【0025】また、隔膜の通気性を1cm<sup>2</sup>当り0.5~3cm<sup>3</sup>/秒に設定したのは、隔膜による電析電流への電圧上昇を0.5V程度に押えるとともに電析時の電鋳液液通液量を低減させるためである。これ以上の数値に設定されると、電析時にカソードケース内に供給する電鋳液液通液量を増加させなければならずポンプ容量を大きくしなければならない。

【0026】本発明では、このように設定することにより、整流器の設備容量を大きくするのを不要にすることができるとともに、ポンプ容量を少なくすることができます、製造装置の低コスト化および小型化を図ることができる。請求項4記載の発明では、隔膜が円筒状マスターの周囲に所定間隔隔てて2重に配設され、外側に配設された隔膜の通気性がJIS 1cm<sup>2</sup>当り5~10cm<sup>3</sup>/秒に設定される。

【0027】したがって、内側の隔膜の内周部に供給される電鋳液と外側の隔膜外の電鋳液を分離して、内側の

隔壁の内周部に供給される電鋳液の温度が引上げられないようになるとともに、拡散反射膜状態の表面粗さでR:0.2~0.8μmの表面層を形成するのに必要な電鋳液の温度を充分に確保することができる。請求項5記載の発明で、カソードケースと電気鋳造槽の間に仕切板が設けられ、該仕切板は、上端部がカソードケースの上部開口部と同一高さになるように配設されるとともに下端部がカソードケースの下端部よりも下方に配設され、電気鋳造槽の外周上端部がカソードケースの上部開口部よりも約5~15mm下方になるように形成され、該外周上端部から電鋳液を流出されるようになっている。

【0028】このように構成した理由を以下に述べる。有機感光体基体用継目なしニッケルベルトやトナー搬送用の電鋳スリーブとして無端状部材を使用した場合には、電気鋳造工程時にこれらベルトやスリーブの外表面に突起、ピンホールあるいはピットが形成されると複写機、ファクシミリ、プリンター等の画像形成時に点欠陥やすじ欠陥等を生じるため、外表面欠陥が生じないように電鋳液に界面活性剤を添加して電気鋳造する必要がある。

【0029】そして、この活性剤は発泡性を有するため、電鋳液の流動を良くするための攪拌時に多量に発泡し、電鋳液面を覆う状態となる。そして、本発明では、円筒状のカソードケースを使用するため、電鋳時の液攪拌効果を良くするために円筒状マスターと隔壁間に空気を供給して攪拌を行なうため、隔壁外の槽内液は隔壁を通過する液のみによる循環のため、高温液は、隔壁を通過して上昇し、槽内の温度分布が均一化するのに多大な時間を要してしまう。

【0030】そして、この温度分布の不均一は陽極から陰極に向かう電流を阻害するため電析膜に圧縮応力の減少、膜厚分布の不均一化、円筒状マスターの端部への電流の集中あるいは円筒状マスターから無端状部材が離型しにくくなる等の種々の不具合を起こしてしまうことになる。このような理由から発明では、カソードケースを効率良く使用するために電気鋳造槽内に供給された電鋳液の流れが温度分布の不均一を起こさずに電気鋳造槽内の温度の立上がりを速やかにでき、さらに、電鋳液に添加される界面活性剤によってエアーバーリング時に発生する多量の泡をスムーズに流出させることが必要となる。

【0031】したがって、本発明では、上述した仕切り板を設けるとともに、電気鋳造槽の外周上端部をカソードケースの上部開口部よりも約5~15mm下方になるように形成することにより、カソードケース内を通過して該ケースの上端部からオーバーフローした電鋳液および隔壁を通過した電鋳液の全てを仕切板の下端部に向かって下降させ、この下降した液を電気鋳造槽の外周部上端から容易に流出させることができる。

【0032】この結果、電気鋳造槽内に供給された電鋳

液の流れが温度分布の不均一を起こすのを防止することができるとともに電気鋳造槽内の温度の立上がりを速やかにことができる。また、エアーバーリングによって発生した泡を電鋳液と分離させた後、仕切板上をオーバーフローさせて電気鋳造槽の外周上端から外部にスムーズに流出させることができる。

### 【0033】

【実施例】以下、本発明を図面に基づいて説明する。図1~7は請求項1~5何れかに記載の発明に係る継目なし可撓性無端状部材およびその無端状部材の製造装置の一実施例を示す図であり、本発明の無端状部材を複写機、ファクシミリ、プリンター等に用いられる有機感光体基体用の継目なしニッケルベルトに適用した例を示している。

【0034】なお、図1は本発明の無端状部材を継目なし可撓性ニッケルベルトに適用したときのそのニッケルベルトを基体として使用した有機感光体の外観図、図2は可撓性ニッケルベルトを使用した有機感光体の機能分離型の断面図、図3は本発明のスルファミン酸ニッケル電気鋳造法によって成形された可撓性ニッケルベルトの断面図である。

【0035】まず、構成を説明する。図1において、1は有機感光体であり、この有機感光体1は、図2に示すように、導電性の基体2、下引き層3、帯電および光キャリヤー発生層4(以下、単に光キャリヤー発生層)、電荷輸送層5からなっている。下引き層3は基体2上に帯電および光キャリヤー発生層4を均一に塗付するためのものであり、電荷輸送層5は帯電量の大部分を占める光キャリヤー発生層4で発生したキャリヤーを効率良く表面に移動させて帯電電荷を消去するものである。

【0036】デジタル複写機等に用いられるこの有機感光体にあっては、帯電した感光体に半導体レーザを照射することにより潜像を形成してトナー現像を行なうものであり、半導体レーザ照射工程におけるレーザ光は光キャリヤー発生層4で全て吸収されて正負キャリヤーとなるのが理想的であるが、画像形成プロセスでが高速化されると光キャリヤー発生層4を厚くして光を全て吸収させることは画像形成上有効とならない。

【0037】このため、光キャリヤー発生層4や下引き層3はプロセスに応じて極力薄くすることが望ましく、潜像を形成したレーザ光の一部(矢印Lで示す)は光キャリヤー発生層4および下引き装置3を透過して基体2に達して反射するようになっている。この反射光は再度下引き層3を透過して光キャリヤー発生層4の裏面で再吸収されて干渉縞や多重反射模様等の不具合な画像形成がなされるため、下引き層3に光散乱剤として酸化チタン微粉末やアルミニナ微粉末等を分散させる。

【0038】この微粉末は高抵抗のため、残留電位の上昇を招くので導電剤を接着剤中に添加させて形成するところがしばしば行なわれる。光散乱剤が分散された下引き

層3は画像プロセスの高速化上あまり厚くすることはできず、潜像を形成するレーザ光に対して光キャリヤー発生層4との界面で反射とやはり散乱透過、基体2表面での反射の成分に分けられる。

【0039】そして、光散乱剤を多量に使用すると光キャリヤー発生層4との界面で反射成分が強くなり、光キャリヤー発生層4裏面での再吸収から画像の階調性が悪化したり、画像のぼけ等の原因となってしまう。このため、下引き層3は適度な光散乱と透過吸収が必要となるが画像プロセスの高速化上吸収に値する膜厚は得られないで、基体2表面を透過光に対して再度散乱する必要が生じる。

【0040】これを防止するために本実施例では、図3に示すように、基体2を主層6と表面層7から構成している。すなわち、50~60℃のスルファミン酸ニッケル電鋳液中で電析された厚さが20~40μm、硬度Hv400~500、裏面6aの粗さRz:0.05~0.3μmにそれぞれ形成された主層6の表面に連続して拡散反射面を有する表面層7を形成したものであり、表面層7は厚さ0.2~3μm、拡散反射面状態の表面粗さでRz:0.2~0.8μm、拡散反射率20~90%に形成されている。

【0041】このように構成すれば上述した透過光の再度散乱に有効に作用することができる。図4、5は上述した基体2を製造する装置を示す図である。まず、構成を説明する。図4において、11は電鋳造槽(以下、単に電鋳槽といふ)であり、この電鋳槽11内には陽極側のチタンケース12が設けられている。また、電鋳槽11内にはニッケルベルトを電析するための電鋳造用の円筒状マスター13が設けられており、この円筒状マスター13は上下方向に延在し、上端部にロッド13aの一端部が取付けられているとともに表面に微小凹凸面が形成されている。

【0042】このロッド13aの他端部はモータ14に取付けられており、円筒状マスター13はモータ14によって回転するようになっている。このモータ14はガイド部材15に摺動自在に設けられるとともに図示しない駆動機構に取付けられており、駆動機構に駆動されることによりガイド部材15に沿って上下方向に案内されるようになっている。

【0043】また、円筒状マスター13の周囲には陰極側のカソードケース16が配設されており、このカソードケース16は円筒状マスター13と約10~50mm離隔して該マスターの周囲に同軸上に配設されるとともにチタンケース12の内部に設けられている。このカソードケース16は図5に示すように構成される。図5において、17は電鋳槽11に取付けられる下端フランジ17であり、この下端フランジ17には後述する流入管が接続されている。この下端フランジ17上にはケース枠18が設けられており、このケース枠18の上部には電鋳液の流出用および通電用の開口部18aが形成されている。また、このケース枠18は

10 ポリプロピレンまたは塩化ビニール等の布からなる複数の隔膜19を支持しており、この隔膜19は円筒状マスター13と約10~50mm離隔して該マスター13の周囲に1重に設けられ、円筒状マスター13を周囲から仕切っている。

【0044】また、この隔膜19は環状の固定用フランジ20によって上部がケース枠18に固定されているとともにその通気性がJIS 1cm<sup>2</sup>当り0.5~3cm<sup>3</sup>/秒に設定されており、円筒状マスター13との間に電鋳液が供給されたときにこの電鋳液を固定用フランジ20からオーバーフローさせるように構成されている。また、ケース枠18の下端側には空気吹出し部材21が設けられており、この吹出し部材21はフィルター22、減圧器23、バルブ24を介して空気源25に接続されており、減圧器23によって減圧された空気源25からの空気を隔膜19と円筒状マスター13の間に供給することにより、隔膜19と円筒状マスター13の間に供給される電鋳液を攪拌するようになっている。そして、この空気吹出し部材21、フィルター22、減圧器23、バルブ24および空気源25はエアーパーリング手段58を構成している。

20 【0045】また、下端フランジ17には流入管31が接続されており、この流入管31はポンプ32に接続されている。このポンプ32はバルブ33を介してスルファミン酸ニッケルの電鋳液がストックされた第1ストック槽34に接続されている。このストック槽34には流出管35を通して電鋳槽11から流出した電鋳液が還流するようになっており、冷却管36によってこの還流液を冷却するとともに、ヒータ37によって電鋳液を50~60℃になるように保温するようになっている。

【0046】また、このポンプ32はバルブ38を介してスルファミン酸ニッケルの電鋳液がストックされた第2ストック槽39に接続されている。このストック槽34にはポンプ40を介して第1ストック槽34からの電鋳液が供給されるようになっており、冷却管41によってこの電鋳液を冷却するとともに、ヒータ42によって電鋳液を30~40℃になるように保温するようになっている。

【0047】したがって、ポンプ32はバルブ33あるいはバルブ38によって切換えられた第1ストック槽34あるいは第2ストック槽39にストックされた異なる温度の電鋳液を下端フランジ17(カソードケースの内周下端部)から隔膜19と円筒状マスター13の間に供給する。これら流入管31、ポンプ32、バルブ33、第1ストック槽34、冷却管36、ヒータ37、バルブ38、第2ストック槽39、冷却管41、ヒータ42はカソードケース16の内周下端部に供給される電鋳液の温度を調整する調整手段59を構成し、流入管31、ポンプ32、バルブ33、第1ストック槽34、バルブ38、第2ストック槽39はカソードケース16の内周下端部から上部開口部に向かって電鋳液を供給可能な供給手段60を構成している。

【0048】一方、カソードケース16と電鋳槽11の間に仕切板44が設けられており、この仕切板44の上端部は

カソードケース16の固定フランジ20(上部開口部)と同一高さになるように配設されるとともに下端部がカソードケース16の下端部よりも下方に配設されている。また、電鋳漕11の外周上端部には摺動部材45が設けられており、この摺動部材45は電鋳漕11に沿って上下方向に移動するように構成され、上端部がカソードケース16の固定フランジ20よりも約5~15mm下方になる位置でねじ46によって電鋳漕11に固定され、上端部から電鋳液を流出するように構成されている。

【0049】次に、このような製造装置によって基体2を製造する方法について説明する。まず、バルブ33を開放してポンプ32を介して流入管31から隔膜19と円筒状マスター13の間に第1ストック層34にストックされ50~60℃の温度に調整された電鋳液を供給するとともに、空気吹出し管21から5~10L/分で空気を供給して電鋳液を攪拌する。

【0050】また、このときの電析電流を5~10A/dm<sup>2</sup>、電析時間を10~30分に設定することにより、円筒状マスター13の表面に厚さを20~40μm、硬度H<sub>v</sub>400~500、裏面粗さR:0.05~0.3μmの主層6が形成される。このとき、空気によって電鋳液が攪拌されるのと同時に電鋳液の流速が早くなるため、主層6にピットややけが発生するはない。

【0051】次いで、電析電流を0.1~1A/dm<sup>2</sup>に可変させるとともに、バルブ33を閉じてバルブ38を開放することにより、ポンプ32を介して流入管31から隔膜19と円筒状マスター13の間に第2ストック層39にストックされ30~40℃の温度に調整された電鋳液を供給する。このとき、円筒状マスター13の表面温度がこの電鋳温度と平衡状態となったら電析電流を5~10A/dm<sup>2</sup>に可変させることにより、主層6の表面に厚さ0.2~3μm、拡散反射面状態の表面粗さでR:0.2~0.8μmの表面層7が形成される。

【0052】すなわち、電鋳温度を主層6を形成するときの温度より必要な表面粗さを得るために温度に下降して電析すると、拡散反射面状態の表面粗さを形成することができる。実験の結果、R:0.2μmを得るために40℃、6A/dm<sup>2</sup>、R:0.4μmを得るために35℃、6A/dm<sup>2</sup>、R:0.6μmを得るために30℃、6A/dm<sup>2</sup>、R:0.8μmを得るために30℃、8A/dm<sup>2</sup>を必要とした。

【0053】そして、上述した温度以下では、スルファミン酸ニッケル電鋳液の硼酸成分が析出すること、および電析電流が円筒状マスター13端部に集中して円筒状マスター13から基体2が離型困難となること、および圧縮応力が減少して主層6に対する応力歪みが大きくなること等によって使用できない状態になってしまった。このように本実施例では、可撓性ニッケルベルトの基体2を、厚さが20~40μm、硬度H<sub>v</sub>400~500、裏面粗さR:0.05~0.3μmの主層6と、その主層6の表面に形成された厚さ0.2~3μm、拡散反射面状態の表面粗さでR

:0.2~0.8μmの表面層7と、から構成しているため、この基体2を有する有機感光体は主層6の変形を伴う使用が3万回、さらに屈曲状態が10万回以上の耐久性を有することから、この主層6上に形成された表面層7が主層6と共に変形した場合にも耐久性が悪化することがない。

【0054】また、表面層6が拡散反射面状態の表面粗さでR:0.2~0.8μmに設定されるので、画像形成用光書き込み光源に対して散乱面として作用し、モアレ画像、多重反射画像が形成されることはなく、良好な画像を形成することができる。また、拡散反射面状態の粗さを有する表面層7に感光体塗付工程でこの表面層上に塗付される下引き層3に対して密着が良好となり、塗付欠陥が発生しない。また、感光体の幅を最小とするために感光体塗付領域で不要な幅端部を切断した場合でも剥離が起こり難い。また、下引き層3の光散乱剤を低減することができるとともに下引き層3を薄くすることができる。

【0055】さらに、感光体の画像形成プロセスでは、感光体と導電性の基体2間がオーム性接触であることから、R:0.2~0.8μmの表面粗さを有する場合には表面性が拡大されることになることから、残留電位の蓄積が減少され、鮮明な画像を得ることができる。また、円筒状マスター13に電析膜を析出する際に円筒状マスター13の表面に形成された微小凹凸面を主層6の裏面に複写する際に、その裏面粗さは、析出膜を電鋳造マスターから離型するための圧縮応力発生用の光沢剤(サッカリン)等の影響によって細かくなり、光沢面となる。

【0056】本実施例では、円筒状マスター13と約10~50mm離隔して該マスター13の周囲に同軸上に配設されるとともに電鋳漕11内を陽陰極に分離する通電、液通可能な隔膜18を有し、上部に開口部18aが形成されたカソードケース16を設けるとともに、カソードケース16の内周下端部に供給される電鋳液の温度を調整する調整手段59を設けているため、円筒状マスター13の周囲の10~50mmの範囲の液温を所定温度に容易に調整することができ、液温を低下させて電鋳液の成分を変えることなしにスルファミン酸ニッケル電鋳造法によって得られた硬度H<sub>v</sub>400~500の主層に連続して表面粗さR:0.2~0.8μmの拡散反射膜状態の表面層を析出することができる。

【0057】また、カソードケース16の下端部から上端部に電鋳液を供給するとともに、カソードケース16内に供給される電鋳液を空気によって攪拌しているため、カソードケース16内に供給される電鋳の温度を均一化することができ、表面層7の表面粗さを容易に均一化することができる。また、隔膜18を円筒状マスター13の周囲に1重に配設し、該隔膜18の通気性をJIS 1cm<sup>2</sup>当り0.5~3cm<sup>3</sup>/秒に設定している。このように構成したのは、カソードケース16はその内部に供給される電鋳液を円筒状マスター13の下端部から上端部まで均一に配分するため適度な液通を行なうための通気性が必要である

からであり、また、カソードケース16内はエアーパーリングされることによって電鋳液中の界面活性剤によって泡が発生し、この泡がカソードケース16内に蓄積して飛散したり円筒状マスター16の上部に付着した状態で持出され、円筒状マスター13を洗浄する際にこの泡が洗浄液を汚してしまうとともに洗浄液に浮遊した後に表面に再付着してしみ等が発生してしまうという不具合が発生するのを防止するためである。

【0058】すなわち、隔膜の通気性を  $1\text{cm}^2$  当り  $0.5\sim 3\text{cm}^3/\text{秒}$  に設定することにより、カソードケース13内に供給される液量を円筒状マスター13の下端部から上端部まで均一に配分することができるとともに、電鋳液が低流量(例えば、 $5\sim 20\text{L}/\text{分}$ )であっても、電鋳液をカソードケース13の上端部からオーバーフローさせることができ、エアーパーリングによって発生した泡をカソードケース13の上端部から容易に流出させることができる。

【0059】また、隔膜19の通気性を  $1\text{cm}^2$  当り  $0.5\sim 3\text{cm}^3/\text{秒}$  に設定することにより、隔膜19による電析電流への電圧上昇を  $0.5\text{V}$  程度に押えるとともに電析時の電鋳液通液量を低減させることができる。但し、これ以上の数値に設定すると、電析時にカソードケース16内に供給する電鋳液通液量を増加させなければならぬため、上述した値にする必要がある。

【0060】したがって、このように設定することにより、電圧上昇を  $0.3\sim 0.5\text{V}$  程度にしてその整流器の設備容量を大きくするのを不要にすることができるとともに、ポンプ容量を少なくすることができ、製造装置の低コスト化および小型化を図ることができる。一方、カソードケース16と電鋳槽11の間に仕切板44を設け、該仕切板44の上端部をカソードケース16の上部開口部と同一高さになるように配設するとともに下端部をカソードケース16の下端部よりも下方に配設し、電鋳槽11の外周上端部がカソードケース16の上部開口部よりも約  $5\sim 15\text{mm}$  下方になるように摺動部材45を設け、該摺動部材45から電鋳液を流出するようにしている。

【0061】このように構成した理由を以下に述べる。有機感光体にあっては、電気鋳造工程時に基体2の外表面に突起、ピンホールあるいはピットが形成されると複写機、ファクシミリ、プリンター等の画像形成時に点欠陥やすじ欠陥等を生じるため、外表面欠陥が生じないように電鋳液に界面活性剤を添加して電気鋳造する必要がある。そして、この活性剤は発泡性を有するため、電鋳液の流動を良くするための攪拌時に多量に発泡し、電鋳液面を覆う状態となる。

【0062】本実施例では、円筒状のカソードケース16を使用するため、電鋳時の液攪拌効果を良くするために円筒状マスター16と隔膜19間に空気を供給して攪拌を行なうため、隔膜19外の槽内液は隔膜を通過する液のみによる循環のため、高温液は、隔膜19を通過して上昇し、

槽内の温度分布が均一化するのに多大な時間を要してしまる。

【0063】そして、この温度分布の不均一は陽極から陰極に向かう電流を阻害するため電析膜に圧縮応力の減少、膜厚分布の不均一化、円筒状マスター13の端部への電流の集中あるいは円筒状マスターから無端状部材が離型しにくくなる等の種々の不具合を起こしてしまうことになる。このような不具合が発生するのを防止するため、本実施例では、カソードケース16を効率良く使用するため電鋳槽11内に供給された電鋳液の流れが温度分布の不均一を起こさずに電鋳槽11内の温度の立上がりを速やかにでき、さらに、電鋳液に添加される界面活性剤によってエアーパーリング時に発生する多量の泡をスムーズに流出させるために、上述した配置状態を取る仕切板44を設けている。このため、カソードケース16内を通過して該ケース16の上端部からオーバーフローした電鋳液および隔膜19を通過した電鋳造液は全て仕切板44の下端部に向かって下降することになり、この下降した液は電鋳槽11の摺動部材45上端から容易に流出する。そして、外部に流出した液は流出管35を通じて第1ストック層34を還流される。

【0064】この結果、電鋳槽11内に供給された電鋳液の流れが温度分布の不均一を起こすのを防止することができるときともに電鋳槽11内の温度の立上がりを速やかにできる。また、エアーパーリングによって発生した泡を電鋳液と分離させた後、仕切板44上をオーバーフローさせて摺動部材45上端から外部にスムーズに流出させることができる。

【0065】なお、本実施例では、隔膜19を1重構造としているが、これに限らず、図6に示すよう円筒状マスターの周囲に所定間隔離で2重に隔膜51、52を配設しても良い。この場合には外側に配設された隔膜52の通気性を  $JIS 1\text{cm}^2$  当り  $5\sim 10\text{cm}^3/\text{秒}$  に設定する。このようにすれば、内側の隔膜51の内周部に供給される電鋳液と外側の隔膜52外の電鋳液を分離して、内側の隔膜51の内周部に供給される電鋳液の温度が引上げられないようになることができ、拡散反射膜状態の表面粗さで  $R_a: 0.2\sim 0.8\mu\text{m}$  の表面層を成形するのに必要な電鋳液の温度を充分に確保することができる。

【0066】また、この通気性では、電析電流に対して遮蔽する事が少なく、電圧上昇を僅か  $0.1\text{V}$  以下にすることができ、整流器の設備容量をさらに小さくすることができる。また、本実施例では、無端状部材を有機感光体の縫目なし可撓性ニッケルベルトに適用しているが、これに限らず、図7に示すように現像トナー搬送用ローラのニッケルスリーブ54に適用しても良い。

【0067】この場合にも上述したような製造方法によって厚さを  $20\sim 40\mu\text{m}$ 、硬度  $H_v: 400\sim 500$ 、裏面粗さ  $R_a: 0.05\sim 0.3\mu\text{m}$  の主層55と、その主層の表面に形成された厚さ  $0.2\sim 3\mu\text{m}$ 、拡散反射面状態の表面粗さで  $R_a: 0.2$

~0.8μmの表面56と、を容易に形成することができる。そして、このように形成することにより、粒径5~15μmの摩擦帶電した現像トナーTを表面層56上の微小凹凸面上に入り込ませずに、円滑に搬送して現像することができる。

【0068】すなわち、通常トナー粒子は現像プロセスの繰り返しおよび摩擦によって粒径が微細化し、現像ローラ表面の凹凸部に入り込むことがあるので、この表面層56の表面粗さをR:0.2~0.8μm程度に調整する(有効値としてはR:0.3~0.5μm)ことにより、現像トナーTを表面層56上の微小凹凸面上に入り込ませずに、円滑に搬送することができる。

【0069】また、このような観点から述べると、基体2を搬送ベルトとして使用した場合も拡散反射面状態の表面粗さでR:0.2~0.8μmに設定することにより、搬送物との摩擦係数を大きくして円滑な搬送を行なうことができる。

#### 【0070】

【発明の効果】請求項1記載の発明によれば、無端状部材を複写機、ファクシミリあるいはプリンター等の搬送ベルトや有機感光体等の繰り返し変形を伴う部材として使用する場合には、スルファミレ酸ニッケル電気铸造法によって成形された主層は変形を伴う使用が3万回、さらに屈曲状態が10万回以上の耐久性を有することから、この主層上に形成された表面層が主層と共に変形した場合にも耐久性が悪化することはない。

【0071】また、表面層が拡散反射面状態の表面粗さでR:0.2~0.8μmに設定されるので、画像形成用光書き込み光源に対して散乱面として作用し、モアレ画像、多重反射画像が形成されることはなく、良好な画像を形成することができる。また、有機感光体基体として使用する場合には拡散反射面状態の表面層に感光体塗付工程でこの表面層上に塗付される下引層に対して密着が良好となり、塗付欠陥が発生しない。また、感光体の幅を最小とするために感光体塗付領域で不要な幅端部を切断した場合でも剥離が起り難い。また、下引き層の光散乱剤を低減することができるとともに下引き層を薄くすることができる。

【0072】さらに、感光体の画像形成プロセスでは、感光体と導電基体間がオーム性接触であることから、R:0.2~0.8μmの表面粗さを有する場合には表面性が拡大されることになることから、残留電位の蓄積が減少され、鮮明な画像を得ることができる。請求項2記載の発明によれば、円筒状マスター16の周囲の10~50mmの範囲の液温を所定温度に容易に調整することができ、液温を低下させて電铸液の成分を変えることなしにスルファミン酸ニッケル電気铸造法によって得られた硬度Hv400~500の主層に連続して表面粗さR:0.2~0.8μmの拡散反射膜状態の表面層を析出することができる。

【0073】また、カソードケースの下端部から上端部

に向かって電铸液を供給する供給手段およびカソードケース内に供給される電铸液を空気によって攪拌するエアーパーリング手段を設けているので、カソードケース内に供給される電铸の温度を均一化して、表面層の表面粗さを容易に均一化することができる。請求項3記載の発明によれば、カソードケース内に供給される液量を円筒状マスターの下端部から上端部まで均一に配分することができるとともに、電铸液が低流量(例えば、5~20L/分)であっても、電铸液をカソードケースの上端部からオーバーフローさせることができ、エアーパーリングによって発生した泡をカソードケースの上端部から容易に流出させることができる。また、隔膜による電析電流への電圧上昇を0.5V程度に押えるとともに電析時の電铸液通液量を低減させることができる。

【0074】この結果、整流器の設備容量を大きくするのを不要にするとともに、ポンプ容量を少なくすることができ、製造装置の低コスト化および小型化を図ることができる。請求項4記載の発明によれば、内側の隔膜の内周部に供給される電铸液と外側の隔膜外の電铸液を分離して、内側の隔膜の内周部に供給される電铸液の温度が引上げられないようになるとともに、拡散反射膜状態の表面粗さでR:0.2~0.8μmの表面層を成形するのに必要な電铸液の温度を充分に確保することができる。

【0075】請求項5記載の発明によれば、カソードケース内を通過して該ケースの上端部からオーバーフローした電铸液および隔膜を通過した電铸液の全てを仕切板の下端部に向かって下降させることができ、この下降した液を電気铸造槽の外周部上端から容易に流出させることができる。この結果、電気铸造槽内に供給された電铸液の流れが温度分布の不均一を起すのを防止することができるとともに電気铸造槽内の温度の立上がりを速やかにすることができる。

【0076】また、エアーパーリングによって発生した泡を電铸液と分離させた後、仕切板上をオーバーフローさせて電気铸造槽の外周上端から外部にスムーズに流出させることができる。

#### 【図面の簡単な説明】

【図1】請求項1~5何れかに記載の発明に係る縫目なし可撓性無端状部材およびその無端状部材の製造装置の一実施例を示す図であり、その無端状部材を縫目なし可撓性ニッケルベルトに適用したときのそのニッケルベルトを基体として使用した有機感光体の外観図である。

【図2】その可撓性ニッケルベルトを使用した有機感光体の機能分離型の断面図である。

【図3】そのスルファミン酸ニッケル電気铸造法によって成形された可撓性ニッケルベルトの断面図である。

【図4】その製造装置の概略構成図である。

【図5】そのカソードケースの構成図である。

【図6】カソードケースの他の態様を示す図である。

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【図7】無端状部材を現像トナー搬送用ローラのスリーブに適用した態様を示すものであり、(a)はその搬送ローラの構成図、(b)はそのスリーブの断面図である。

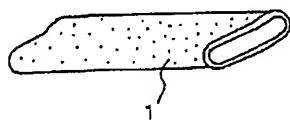
## 【符号の説明】

- 2 基体(無端状部材)  
6、55 主層  
7、56 表面層  
11 電鍍層

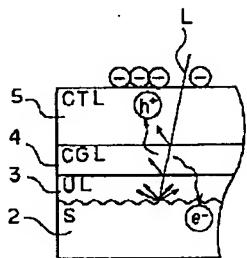
18

- 13 円筒状マスター  
16 カソードケース  
19、51、52 隔膜  
44 仕切板  
54 スリーブ(無端状部材)  
58 エアーパーリング手段  
59 調整手段  
60 供給手段

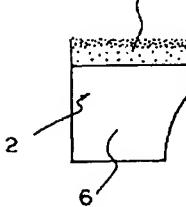
【図1】



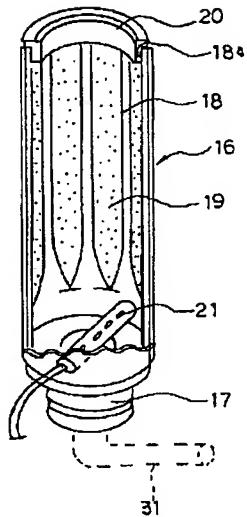
【図2】



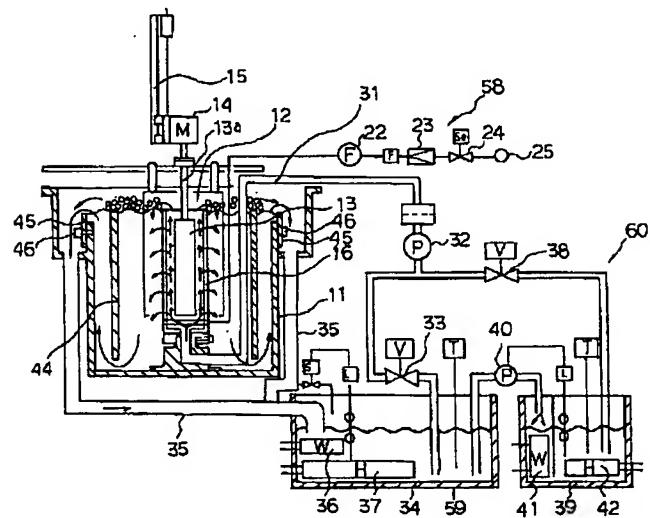
【図3】



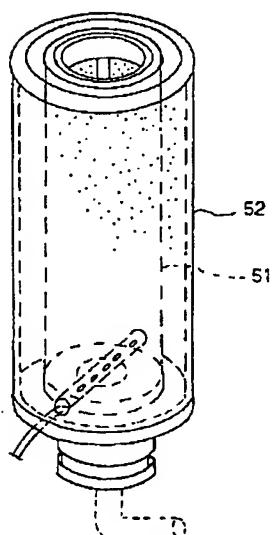
【図5】



【図4】

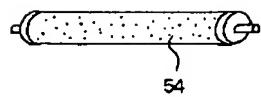


【図6】

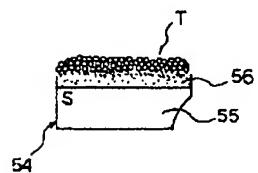


【図7】

(a)



(b)



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CLAIMS

## [Claim(s)]

[Claim 1] In the joint-less flexibility endless-like member which is fabricated by nickel amiosulfonate electrochemical molding and used for the base of an organic photo conductor, the sleeve for development toner conveyance, etc. Thickness 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, and a 3-micrometer main stratum, the surface roughness of the thickness 0 formed in the front face of the main stratum, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and a 8-micrometer surface layer - - since -- the joint-less flexibility endless-like member characterized by becoming.

[Claim 2] It is the manufacturing installation of a flexible endless-like member according to claim 1. \*\*\*\*, The cylindrical master for electroforming by which it was extended and prepared in the vertical direction in this \*\*\*\*, and the minute concave convex was formed in the front face, The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of \*\*\*\* into a positive-negative pole and \*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part, It goes to up opening from the inner circumference lower limit section of this cathode case. The supply means which can supply electrocasting liquid, The manufacturing installation of the joint-less flexibility endless-like member characterized by having an Ayr bubbling means to agitate with air the electrocasting liquid supplied in said cathode case, and the adjustment device which adjusts the temperature of the electrocasting liquid supplied in said cathode case.

[Claim 3] The manufacturing installation of the joint-less flexibility endless-like member according to claim 2 characterized by for said diaphragm being arranged in the perimeter of a cylindrical master by one-fold, and setting the permeability of this diaphragm per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second.

[Claim 4] The manufacturing installation of the joint-less flexibility endless-like member according to claim 2 characterized by setting the permeability of the diaphragm by which said diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\* duplex, and was arranged outside as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>.

[Claim 5] A dashboard is formed between said cathode cases and \*\*\*\*. This dashboard While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case. claims 2-4 characterized by being formed so that the periphery upper limit section of said \*\*\*\* may consist of up opening of a cathode case caudad about 5-15mm, and making it make electrocasting liquid flow out of this periphery upper limit section -- the manufacturing installation of a joint-less flexibility endless-like member given in any they are.

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[Translation done.]

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to the joint-less flexibility endless-like member used for the base of the organic photo conductor used for a copying machine, facsimile, a printer, etc., and the manufacturing installation of the endless-like member in detail about a joint-less flexibility endless-like member and the manufacturing installation of the endless-like member.

#### [0002]

[Description of the Prior Art] As an approach of fabricating the joint-less flexibility endless-like member used for the base of an organic photo conductor etc. from the former by nickel amiosulfonate electrochemical molding, it is known by JP,3-17289,A, JP,3-17290,A, JP,3-17291,A, etc., for example.

[0003] He is trying for this thing to deposit a electrocasting sleeve on this master by performing honing using a glass bead by using the master for electroforming (metal mold) in which the irregularity of 5mm or less of RZ abbreviation was formed. Moreover, as an approach of sampling a electrocasting sleeve from a master, by adding brighteners, such as saccharin sodium, to electrocasting liquid as a compressive-stress agent, compressive stress is given to a electrocasting sleeve, and by making it become large 10-20 micrometers rather than a electrocasting master, or heating and enlarging the thermal expansion and contraction of a master and a sleeve, a sleeve enlarges path clearance of a sleeve and a master, or is carrying out using cooling water or a sleeve omission medium etc.

[0004] Thus, he is trying to obtain the electrocasting sleeve by which the irregularity formed on the master was copied at the rear face. Moreover, after sampling from a master the sleeve electroformed in addition to this, it is also made to perform crepe plating and compound plating of ceramic impalpable powder to the sleeve front face at another process. In addition, as mentioned above, as an approach of processing irregularity, chemical etching, laser beam machining, a grinding process, or polish processing by the wrapping paper is performed to the electrocasting master, and in order to obtain the granularity of a electrocasting sleeve front face, he is trying to adjust the irregularity of the front face of a electrocasting master.

#### [0005]

[Problem(s) to be Solved by the Invention] However, since brighteners, such as saccharin sodium, were added in order to make a electrocasting sleeve easy to extract from a electrocasting master if it was in endless-like members, such as such a conventional electrocasting sleeve, when the use accompanied by deformation of a sleeve was repeated, there was a problem that the endurance will get worse very much.

[0006] That is, when brighteners, such as saccharin sodium, are added, a sleeve can be easily sampled from a electrocasting master, but on the other hand the operation which is going to graduate electrocasting master surface roughness in response to the effect of a brightener takes place to coincidence, and a electrocasting master front face must be made coarser than granularity required for a sleeve front face. It is fine about 5 micrometers and, specifically, the direction of surface becomes surface roughness 0, 1-Rz 0, and gloss and a thing with smooth nature from the rear face of a sleeve.

[0007] And since it is necessary to secure this inclination 10 micrometers or more when the straightness of a master and a master of the path clearance between sleeves is set to 0, in order to draw out a sleeve easily from a electrocasting master, when the path of a electrocasting master becomes less than [ phi40mm ], it must become in the direction which strengthens compressive stress more, and must make the addition of a brightener increase further.

[0008] For this reason, many sulfur comes to be contained in the film which carries out electrocrystallization,

and the film degree of hardness as a sleeve will become high, and, on the whole, will become weak. Consequently, when the use accompanied by deformation of a sleeve was repeated, that endurance got worse very much, and when used for the base of an organic photo conductor, the belt for toner conveyance, etc., there was a problem that that function could not fully be demonstrated.

[0009] Moreover, it was required to remove and graduate a minute ripple component from the granularity formed in the master front face, and in order to have drawn out the sleeve easily from the electrocasting master, since it was necessary to carry out polish processing of the master front face with impalpable powder, such as a calcium carbonate and an aluminum oxide, there was a problem that the cost for obtaining a electrocasting sleeve will increase.

[0010] Invention according to claim 1 then, by forming thickness 0 and an about 2-3-micrometer surface layer with the granularity of a diffuse reflector condition in the front face of the main stratum of an endless-like member Also when the use accompanied by deformation is repeated, while being able to prevent that endurance gets worse, also when it is used for an organic photo conductor, the belt for toner conveyance, etc., it aims at offering the joint-less flexibility endless-like member which can fully demonstrate the function.

[0011] Invention according to claim 2 aims at offering the manufacturing installation of the joint-less flexibility endless-like member which can form easily RZ 0, 2-0 and a 8-micrometer surface layer on the surface of a main stratum by the surface roughness of thickness 0, 2-3 micrometers, and a diffuse reflector condition. Even when electrocasting liquid is supplied few in a cathode case, invention according to claim 3 The bubble which was made to overflow electrocasting liquid from up opening of this case, and was generated by Ayr bubbling can be made to flow out of cathode case up opening easily. While being able to prevent a bubble adhering to the upper limit part of an endless-like member, and soiling this endless-like member etc., it aims at offering the manufacturing installation of small [ which can lessen capacity of the feed pump of electrocasting liquid ], and a low cost joint-less flexibility endless-like member.

[0012] Invention according to claim 4 for the purpose of invention according to claim 3 in addition, by making a diaphragm into double structure The electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated. The temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up. It aims at offering the manufacturing installation of a joint-less flexibility endless-like member which can fully secure the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition.

[0013] While invention according to claim 5 can supply electrocasting liquid toward up opening from the inner circumference lower limit section of a cathode case, making the temperature distribution of the electrocasting liquid supplied to the interior of a cathode case equalize It aims at offering the manufacturing installation of a joint-less flexibility endless-like member which it can dissociate [ manufacturing installation ] from electrocasting liquid and can make the bubble which was made to overflow electrocasting liquid from up opening of this case, and was generated by Ayr bubbling flow out easily out of \*\*\*\*\*.

[0014] [Means for Solving the Problem] In the joint-less flexibility endless-like member which is fabricated by nickel amiosulfonate electrochemical molding and used for the base of an organic photo conductor, the sleeve for development toner conveyance, etc. in order that invention according to claim 1 may solve the above-mentioned technical problem the surface roughness of the thickness 0 by which thickness was formed in the front face of 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, a 3-micrometer main stratum, and its main stratum, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and a 8-micrometer surface layer -- since -- it is characterized by becoming.

[0015] In order that invention according to claim 2 may solve the above-mentioned technical problem, it is the manufacturing installation of a flexible endless-like member according to claim 1. \*\*\*\*\*, The cylindrical master for electroforming by which it was extended and prepared in the vertical direction in this \*\*\*\*\* , and the minute concave convex was formed in the front face, The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of \*\*\*\*\* into a positive-negative pole and \*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part, It goes to up opening from the inner circumference lower limit section of this cathode case. The supply means which can supply electrocasting liquid, It is characterized by having an Ayr bubbling means to agitate with air the electrocasting liquid supplied

in said cathode case, and the adjustment device which adjusts the temperature of the electrocasting liquid supplied in said cathode case.

[0016] In invention according to claim 2, said diaphragm is arranged in the perimeter of a cylindrical master by one-fold, and invention according to claim 3 is characterized by setting the permeability of this diaphragm per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second, in order to solve the above-mentioned technical problem. Invention according to claim 4 is characterized by setting the permeability of the diaphragm by which said diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\*\* duplex, and was arranged outside as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup> in invention according to claim 2, in order to solve the above-mentioned technical problem.

[0017] In invention given in any they are, a dashboard is formed between said cathode cases and \*\*\*\*\* in order that invention according to claim 5 may solve the above-mentioned technical problem -- claims 2-4 -- this dashboard While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case. It is formed so that the periphery upper limit section of said \*\*\*\*\* may consist of up opening of a cathode case caudad about 5-15mm, and it is characterized by making it make electrocasting liquid flow out of this periphery upper limit section.

[0018]

[Function] the surface roughness of the thickness 0 by which the endless-like member was formed in the front face of 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, a 3-micrometer main stratum, and its main stratum in thickness in invention according to claim 1, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and a 8-micrometer surface layer -- since -- it is constituted. Therefore, also when the main stratum fabricated by nickel amiosulfonate electrochemical molding when an endless-like member was used as a member accompanied by repeat deformation of conveyance belts, organic photo conductors, etc., such as a copying machine, facsimile, or a printer, deforms the surface layer by which the use accompanied by deformation was formed on this main stratum 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum, endurance does not get worse.

[0019] Moreover, since a surface layer is set as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, it acts as the diffusing surface to the light source for image formation write-in [ optical ], a moire image and a multiple echo image are not formed, and a good image can be formed. Moreover, in using it as an organic photo conductor base, adhesion becomes good to the undercoating layer used as the surface layer which has the granularity of a diffuse reflector condition with \*\* on this surface layer at a process with \*\*\*\*\* , and a defect with \*\* does not occur. Moreover, in order to make width of face of a photo conductor into min, even when an unnecessary width-of-face edge is cut in a field with \*\*\*\*\* , exfoliation cannot take place easily. Moreover, while being able to reduce the light-scattering agent of an under-coating layer, an under-coating layer can be made thin.

[0020] Furthermore, since front-face nature will be expanded when it has RZ 0, 2-0 and 8-micrometer surface roughness, since between a photo conductor and an electric conduction base is ohmic contact when applied to the image formation process of a photo conductor, are recording of rest potential can decrease and a clear image can be obtained. The cylindrical master for electroforming which is prepared in \*\*\*\*\* and extends in the vertical direction in invention according to claim 2, The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of \*\*\*\*\* into a positive-negative pole and \*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part, It has the adjustment device and \*\* which adjust the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of a cathode case.

[0021] Thus, if being constituted is in the approach of manufacturing the joint-less flexibility endless-like member used for the base of an organic photo conductor etc. by nickel amiosulfonate electrochemical molding, it is for preventing copying at the rear face of the granularity base of the field of a cylindrical master, and the rear-face granularity usually becoming fine under the effect of the brightener for compressive-stress generating for releasing the deposit film from mold from a \*\*\*\*\* master (saccharin) etc., and becoming a glossy surface.

[0022] That is, the surface layer of surface roughness RZ 0, 2-0 and a 8-micrometer diffuse reflection film condition can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding by adjusting easily the solution temperature of the range of 10-

50mm around a cylindrical master to predetermined temperature, without reducing solution temperature and changing the component of electrocasting liquid. Moreover, in this invention, since an Ayr bubbling means to agitate with air the electrocasting liquid supplied in a supply means to supply electrocasting liquid toward the upper limit section from the lower limit section of a cathode case, and a cathode case is established, the temperature of electrocasting supplied in a cathode case is equalized, and the surface roughness of a surface layer is equalized easily.

[0023] In invention according to claim 3, a diaphragm is arranged in the perimeter of a cylindrical master by one-fold, and the permeability of this diaphragm is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second. Thus, it is because the permeability for performing moderate \*\*\*\* for a cathode case distributing the electrocasting liquid supplied to the interior to homogeneity from the lower limit section of a cylindrical master to the upper limit section is required for being constituted. Moreover, a bubble generates the inside of a cathode case with the surfactant in electrocasting liquid by carrying out Ayr bubbling. It is carried out, after this bubble was accumulated into the cathode case, and dispersed or has adhered to the cylindrical master upper part. In case a cylindrical master is washed, while this bubble will soil a penetrant remover, after floating to a penetrant remover, it is for preventing that the fault that will carry out the reattachment to a front face and a stain etc. will occur occurs.

[0024] Namely, while being able to distribute to homogeneity the volume supplied in a cathode case by setting the permeability of a diaphragm per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second from the lower limit section of a cylindrical master to the upper limit section Even if electrocasting liquid is a low flow rate (for example, 5 - 20L / part; however L show a liter), electrocasting liquid can be in an overflow condition from the upper limit section of a cathode case, and the bubble generated by air bubbling can be made to flow out of the upper limit section of a cathode case easily.

[0025] Moreover, the permeability of a diaphragm was set per [ 0 ] two and as a 5-3cm<sup>3</sup>/second 1cm for reducing the amount of electrocasting liquid dipping at the time of electrocrystallization, while pressing down the power surge to the electrocrystallization current by the diaphragm to 0 and about 5V. If set as the numeric value beyond this, pump capacity must be enlarged that the amount of electrocasting liquid dipping supplied in a cathode case at the time of electrocrystallization must be made to increase.

[0026] In this invention, while being able to make it unnecessary to enlarge installed capacity of a rectifier by setting up in this way, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. In invention according to claim 4, the permeability of the diaphragm by which the diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\*\* duplex, and was arranged outside is set as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>.

[0027] Therefore, the electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition can fully be secured. By invention according to claim 5, a dashboard is formed between a cathode case and \*\*\*\*\*. This dashboard While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case. It is formed so that the periphery upper limit section of \*\*\*\*\* may consist of up opening of a cathode case caudad about 5-15mm, and electrocasting liquid is flowed out of this periphery upper limit section.

[0028] Thus, the constituted reason is explained below. Since a point defect, a \*\*\*\* defect, etc. will be produced at the time of image formation, such as a copying machine, facsimile, and a printer, if a projection, a pinhole, or a pit is formed in the outside surface of these belts or a sleeve at the time of an electroforming process when an endless-like member is used as the joint-less nickel belt for organic photo conductor bases, or a electrocasting sleeve for toner conveyance, it is necessary to add and electrocast a surfactant in electrocasting liquid so that an outside-surface defect may not arise.

[0029] And since this activator has fizz, it foams so much at the time of churning for improving a flow of electrocasting liquid, and it will be in a wrap condition about a electrocasting oil level at it. And in order to supply air between a cylindrical master and a diaphragm in order to use a cylinder-like cathode case and to improve the liquid stirring effect at the time of electrocasting in this invention, and to agitate, for circulation only with the liquid with which \*\*\*\*\* besides a diaphragm passes a diaphragm, elevated-temperature liquid

will pass a diaphragm, and will go up, and great time amount will be taken for the temperature distribution in \*\* to equalize.

[0030] And in order that the ununiformity of these temperature distribution may prevent the current which goes to cathode from an anode plate, various faults, such as being hard coming to release an endless-like member from mold, will be started from the concentration or the cylindrical master of a current to reduction in compressive stress, ununiformity-izing of thickness distribution, and the edge of a cylindrical master on the electrocrystallization film. Since it is such, in order to use a cathode case efficiently, in invention, it is necessary for the flow of the electrocasting liquid supplied in \*\*\*\*\* to be able to make the start of the temperature in \*\*\*\*\* prompt, without starting the ununiformity of temperature distribution, and to make a lot of bubbles generated with the surface active agent further added by electrocasting liquid at the time of Ayr bubbling flow out smoothly.

[0031] Therefore, by forming the periphery upper limit section of \*\*\*\*\* so that it may consist of up opening of a cathode case caudad about 5-15mm while forming the diaphragm mentioned above in this invention All the electrocasting \*\*\*\* that passed the electrocasting liquid and the diaphragm which passed through the inside of a cathode case and were overflowed from the upper limit section of this case can be dropped toward the lower limit section of a dashboard, and this liquid that descended can be made to flow out of the periphery section upper limit of \*\*\*\*\* easily.

[0032] Consequently, while being able to prevent that the flow of the electrocasting liquid supplied in \*\*\*\*\* starts the ununiformity of temperature distribution, the start of the temperature in \*\*\*\*\* can be made prompt. Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard top can be made to be able to overflow and it can be made to flow out of the periphery upper limit of \*\*\*\*\* outside smoothly.

[0033]

[Example] Hereafter, this invention is explained based on a drawing. drawing 1 R>1-7 -- claims 1-5 -- it is drawing showing the joint-less flexibility endless-like member concerning invention given in any they are, and one example of the manufacturing installation of the endless-like member, and the example which applied the endless-like member of this invention to the joint-less nickel belt for organic photo conductor bases used for a copying machine, facsimile, a printer, etc. is shown.

[0034] In addition, the external view of the organic photo conductor which used the nickel belt when drawing 1 applies the endless-like member of this invention to a joint-less flexibility nickel belt as a base, the sectional view of the functional discrete type of the organic photo conductor with which drawing 2 used the flexible nickel belt, and drawing 3 are the sectional views of the flexible nickel belt fabricated by the nickel amiosulfonate electrochemical molding of this invention.

[0035] First, a configuration is explained. In drawing 1 , 1 is an organic photo conductor, and this organic photo conductor 1 consists of the conductive base 2, the under-coating layer 3, electrification and an optical carrier generating layer 4 (following, only optical carrier generating layer), and a charge transportation layer 5, as shown in drawing 2 . The under-coating layer 3 is for making electrification and the optical carrier generating layer 4 into homogeneity with \*\* on a base 2, and the charge transportation layer 5 moves efficiently the carrier generated in optical carrier \*\*\*\*\* 4 which occupies most amounts of electrifications to a front face, and eliminates an electrification charge.

[0036] If it is in this organic photo conductor used for a digital copier etc., it is ideal to form a latent image, to perform toner development by irradiating semiconductor laser at the electrified photo conductor, and for the laser beam in a semiconductor laser exposure process to be altogether absorbed in the optical carrier generating layer 4, and to become a positive/negative carrier, but if it \*\*\*\*\* in an image formation process, it will not become effective on image formation to thicken the optical carrier generating layer 4 and to make all light absorb.

[0037] For this reason, as for the optical carrier generating layer 4 or the under-coating layer 3, it is desirable to make it thin as much as possible according to a process, a part of laser beam (an arrow head L shows) in which the latent image was formed penetrates the optical carrier generating layer 4 and under-coating equipment 3, it reaches a base 2, and they reflect it. Since the under-coating layer 3 is penetrated again, resorption is carried out with the rear face of the optical carrier generating layer 4 and fault pattern [ an interference fringe, a multiple echo pattern, etc. ] image formation is made, this reflected light makes the under-coating layer 3 distribute titanium oxide impalpable powder, alumina impalpable powder, etc. as a light-scattering agent.

[0038] Since this impalpable powder causes the rise of rest potential for high resistance, making it add in a binder and forming an electric conduction agent is often performed. The under-coating layer 3 by which the light-scattering agent was distributed cannot be made not much thick on improvement in the speed of an image process, but is too divided into the component of reflection in dispersion transparency and base 2 front face with reflection by the interface with the optical carrier generating layer 4 to the laser beam which forms a latent image.

[0039] And if a light-scattering agent is used so much, a reflective component will become strong by the interface with the optical carrier generating layer 4, and the gradation nature of an image will get worse from the resorption in optical carrier generating layer 4 rear face, or it will become causes, such as dotage of an image. For this reason, although moderate light scattering and transparency absorption are needed, since the thickness which deserves absorption of an image process on improvement in the speed is not obtained, the under-coating layers 3 will need to be again scattered about to the transmitted light in base 2 front face.

[0040] In order to prevent this, as shown in drawing 3, the base 2 consists of a main stratum 6 and a surface layer 7 at this example. The thickness by which electrocrystallization was carried out in 50-60-degree C nickel amiosulfonate electrocasting liquid Namely, 20-40 micrometers, The surface layer 7 which has a diffuse reflector succeeding degrees of hardness 400-HV 500, granularity RZ 0, 05-0 of rear-face 6a, and the front face of the main stratum 6 formed in 3 micrometers, respectively is formed. The surface layer 7 is formed in RZ 0, 2-0, 8 micrometers, and 20 - 90% of diffuse reflection factors by the surface roughness of thickness 0, 2-3 micrometers, and a diffuse reflector condition.

[0041] thus, the transmitted light mentioned above when constituted -- again -- dispersion -- effective -- it can act . Drawing 4 and 5 are drawings showing the equipment which manufactures the base 2 mentioned above. First, a configuration is explained. In drawing 4, 11 is \*\*\*\*\* (only henceforth \*\*\*\*\*) and the titanium case 12 by the side of an anode plate is established in this \*\*\*\*\* 11. Moreover, in \*\*\*\*\* 11, the cylindrical master 13 for electroforming for carrying out electrocrystallization of the nickel belt is formed, this cylindrical master 13 extends in the vertical direction, and while the end section of rod 13a is attached in the upper limit section, the minute concave convex is formed in the front face.

[0042] The other end of this rod 13a is attached in the motor 14, and the cylindrical master 13 rotates by the motor 14. This motor 14 is attached in the drive which is not illustrated while being prepared in the guide member 15 free [ sliding ], and is guided in the vertical direction along with the guide member 15 by driving to a drive.

[0043] Moreover, the cathode case 16 by the side of cathode is arranged in the perimeter of the cylindrical master 13, and this cathode case 16 is prepared in the interior of the titanium case 12 while it is isolated about 10-50mm with the cylindrical master 13 and is arranged in the perimeter of this master on the same axle. This cathode case 16 is constituted as shown in drawing 5 . In drawing 5, 17 is the lower limit flange 17 attached in \*\*\*\*\* 11, and the inhalant canal mentioned later is connected to this lower limit flange 17. The case frame 18 is formed on this lower limit flange 17, and the object for the outflow of electrocasting liquid and opening 18a for energization are formed in the upper part of this case frame 18. Moreover, this case frame 18 is supporting two or more diaphragms 19 which consist of cloth, such as polypropylene or vinyl chloride, this diaphragm 19 is isolated about 10-50mm with the cylindrical master 13, and is prepared in the perimeter of this master 13 one-fold, and a batch requires the cylindrical master 13 from a perimeter.

[0044] Moreover, while the upper part is being fixed to the case frame 18 by the annular clamping flange 20, that permeability is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second, and when electrocasting \*\*\*\* is supplied between the cylindrical masters 13, this diaphragm 19 is constituted so that this electrocasting liquid may be made to overflow from a clamping flange 20. Moreover, the air blow-off member 21 is formed in the lower limit side of the case frame 18, this blow-off member 21 is connected to the air supply 25 through the filter 22, the pressure reducer 23, and the bulb 24, and the electrocasting liquid supplied between a diaphragm 19 and the cylindrical master 13 is agitated by supplying the air from the air supply 25 decompressed by the pressure reducer 23 between a diaphragm 19 and the cylindrical master 13. And this air blow-off member 21, the filter 22, the pressure reducer 23, the bulb 24, and the air supply 25 constitute the Ayr bubbling means 58.

[0045] Moreover, the inhalant canal 31 is connected to the lower limit flange 17, and this inhalant canal 31 is connected to the pump 32. This pump 32 is connected to 1st stock \*\* 34 by which sulfamic acid nickel-electroforming liquid was stocked through the bulb 33. While the electrocasting liquid which flowed into this stock \*\* 34 out of \*\*\*\*\* 11 through the excurrent canal 35 flows back and cooling this reflux with a cooling

pipe 36, electrocasting liquid is kept warm at a heater 37 so that it may become 50-60 degrees C. [0046] Moreover, this pump 32 is connected to 2nd stock \*\* 39 by which sulfamic acid nickel-electroforming liquid was stocked through the bulb 38. While the electrocasting liquid from 1st stock \*\* 34 is supplied to this stock \*\* 34 through a pump 40 and cooling this electrocasting liquid with a cooling pipe 41, electrocasting liquid is kept warm at a heater 42 so that it may become 30-40 degrees C.

[0047] Therefore, a pump 32 supplies the electrocasting liquid of different temperature stocked by 1st stock \*\* 34 or 2nd stock \*\* 39 switched by the bulb 33 or the bulb 38 between a diaphragm 19 and the cylindrical master 13 from the lower limit flange 17 (inner circumference lower limit section of a cathode case). These inhalant canals 31, a pump 32, a bulb 33, 1st stock \*\* 34, a cooling pipe 36, a heater 37, a bulb 38, 2nd stock \*\* 39, a cooling pipe 41, and a heater 42 constitute the adjustment device 59 which adjusts the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cathode case 16. An inhalant canal 31, a pump 32, a bulb 33, 1st stock \*\* 34, a bulb 38, and 2nd stock \*\* 39 constitute the supply means 60 which can supply electrocasting liquid toward up opening from the inner circumference lower limit section of the cathode case 16.

[0048] On the other hand, the dashboard 44 is formed between the cathode case 16 and \*\*\*\*\* 11, and while the upper limit section of this dashboard 44 is arranged so that it may become the same height as the fixed flange 20 (up opening) of the cathode case 16, the lower limit section is caudad arranged rather than the lower limit section of the cathode case 16. Moreover, it is constituted so that it may \*\*\* in the location where it is constituted in so that the slide member 45 may be formed in the periphery upper limit section of \*\*\*\*\* 11 and this slide member 45 may move in the vertical direction along with \*\*\*\*\* 11, and the upper limit section consists of a fixed flange 20 of the cathode case 16 caudad about 5-15mm, and may be fixed to \*\*\*\*\* 11 by 46 and the electrocasting liquid from the upper limit section may be flowed out.

[0049] Next, how to manufacture a base 2 by such manufacturing installation is explained. First, while supplying the electrocasting liquid which opened the bulb 33 wide, was stocked by the 1st stock layer 34 between the diaphragm 19 and the cylindrical master 13 from the inhalant canal 31 through the pump 32, and was adjusted to the temperature of 50-60 degrees C, air is supplied by part for the air blow-off tubing 21-5 - 10L/, and electrocasting liquid is agitated.

[0050] Moreover, 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, and the 3-micrometer main stratum 6 are formed in the front face of the cylindrical master 13 in thickness by setting up the electrocrystallization current at this time as 5 - 10 A/dm<sup>2</sup>, and setting up electrocrystallization time amount in 10 - 30 minutes. Since the rate of flow of electrocasting liquid becomes that electrocasting liquid is agitated by air and coincidence early at this time, there is no \*\* which a pit and desperation generate in a main stratum 6.

[0051] Subsequently, while carrying out adjustable [ of the electrocrystallization current ] to 0, 1 - 1 A/dm<sup>2</sup>, the electrocasting liquid which was stocked by the 2nd stock layer 39 between the diaphragm 19 and the cylindrical master 13 from the inhalant canal 31 through the pump 32, and was adjusted to the temperature of 30-40 degrees C is supplied by closing a bulb 33 and opening a bulb 38. At this time, if the skin temperature of the cylindrical master 13 will be in this electrocasting temperature and equilibrium, RZ 0, 2-0 and the 8-micrometer surface layer 7 will be formed in the front face of a main stratum 6 by the surface roughness of thickness 0, 2-3 micrometers, and a diffuse reflector condition by carrying out adjustable [ of the electrocrystallization current ] to 5 - 10 A/dm<sup>2</sup>.

[0052] That is, it descends to the temperature for obtaining surface roughness more nearly required than the temperature when forming a main stratum 6 for electrocasting temperature, and if electrocrystallization is carried out, the surface roughness of a diffuse reflector condition can be formed. As a result of the experiment, in order to obtain RZ0 and 2 micrometers, to obtain 40 degrees C, 6 A/dm<sup>2</sup>, RZ0, and 4 micrometers, to obtain 35 degrees C, 6 A/dm<sup>2</sup>, RZ0, and 6 micrometers and to obtain 30 degrees C, 6 A/dm<sup>2</sup>, RZ0, and 8 micrometers, 30 degrees C and 8 A/dm<sup>2</sup> were needed.

[0053] And it has been in the condition that it cannot be used that the boric acid component of nickel amiosulfonate electrocasting liquid deposits, that an electrocrystallization current concentrates on cylindrical master 13 edge, and it becomes difficult from the cylindrical master 13 to release a base 2 from mold, when compressive stress decreases and the stress-strain diagram to a main stratum 6 becomes large, below at the temperature mentioned above. In this example, thickness the base 2 of a flexible nickel belt Thus, 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, and the 3-micrometer main

stratum 6, the surface roughness of the thickness 0 formed in the front face of the main stratum 6, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and the 8-micrometer surface layer 7 -- since, since it constitutes Also when the organic photo conductor which has this base 2 deforms the surface layer 7 by which the use accompanied by deformation of a main stratum 6 was formed on this main stratum 6 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum 6, endurance does not get worse.

[0054] Moreover, since a surface layer 6 is set as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, it acts as the diffusing surface to the light source for image formation write-in [ optical ], a moire image and a multiple echo image are not formed, and a good image can be formed.

Moreover, adhesion becomes good to the under-coating layer 3 used as the surface layer 7 which has the granularity of a diffuse reflector condition with \*\* on this surface layer at a process with \*\*\*\*\*\*, and a defect with \*\* does not occur. Moreover, in order to make width of face of a photo conductor into min, even when an unnecessary width-of-face edge is cut in a field with \*\*\*\*\*\*, exfoliation cannot take place easily. Moreover, while being able to reduce the light-scattering agent of the under-coating layer 3, the under-coating layer 3 can be made thin.

[0055] Furthermore, in the image formation process of a photo conductor, since front-face nature will be expanded when it has RZ 0, 2-0 and 8-micrometer surface roughness, since between a photo conductor and the conductive base 2 is ohmic contact, are recording of rest potential can decrease and a clear image can be obtained. Moreover, in case the minute concave convex formed in the front face of the cylindrical master 13 when the electrocrystallization film was deposited to the cylindrical master 13 is copied at the rear face of a main stratum 6, under the effect of the brightener for compressive-stress generating for releasing the deposit film from mold from a \*\*\*\*\* master (saccharin) etc., the rear-face granularity becomes fine and serves as a glossy surface.

[0056] The energization which divides the inside of \*\*\*\*\* 11 into a positive-negative pole while being isolated about 10-50mm with the cylindrical master 13 and being arranged in the perimeter of this master 13 on the same axle in this example, While establishing the cathode case 16 where have the diaphragm 18 in which \*\*\* is possible, and opening 18a was formed in the upper part Since the adjustment device 59 which adjusts the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cathode case 16 is formed, The solution temperature of the range of 10-50mm around the cylindrical master 16 can be easily adjusted to predetermined temperature. The surface layer of surface roughness RZ 0, 2-0 and a 8-micrometer diffuse reflection film condition can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding, without reducing solution temperature and changing the component of electrocasting liquid.

[0057] moreover, since the electrocasting liquid supplied in the cathode case 16 is agitated with air while resembling the upper limit section from the lower limit section of the cathode case 16 and supplying electrocasting liquid, the temperature of electrocasting supplied in the cathode case 16 can be equalized, and the surface roughness of a surface layer 7 can be equalized easily. Moreover, the diaphragm 18 was arranged in the perimeter of the cylindrical master 13 one-fold, and the permeability of this diaphragm 18 is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second. Thus, it is because having constituted distributes to homogeneity the electrocasting liquid with which the cathode case 16 is supplied to the interior from the lower limit section of the cylindrical master 13 to the upper limit section, so the permeability for performing moderate \*\*\* is required. Moreover, a bubble generates the inside of the cathode case 16 with the surfactant in electrocasting liquid by carrying out Ayr bubbling. It is carried out, after this bubble was accumulated into the cathode case 16, and dispersed or has adhered to the upper part of the cylindrical master 16. In case the cylindrical master 13 is washed, while this bubble will soil a penetrant remover, after floating to a penetrant remover, it is for preventing that the fault that will carry out the reattachment to a front face and a stain etc. will occur occurs.

[0058] Namely, while being able to distribute to homogeneity the volume supplied in the cathode case 13 by setting the permeability of a diaphragm per [ 0 ] two and as a 5-3cm<sup>3</sup>/second 1cm from the lower limit section of the cylindrical master 13 to the upper limit section Even if electrocasting liquid is a low flow rate (a part for for example, 5 - 20L/), electrocasting liquid can be made to be able to overflow from the upper limit section of the cathode case 13, and the bubble generated by air bubbling can be made to flow out of the upper limit section of the cathode case 13 easily.

[0059] Moreover, by setting the permeability of a diaphragm 19 per [ 0 ] two and as a 5-3cm<sup>3</sup>/second 1cm,

while pressing down the power surge to the electrocrystallization current by the diaphragm 19 to 0 and about 5V, the amount of electrocasting liquid dipping at the time of electrocrystallization can be reduced. However, if it is set as the numeric value beyond this, in order to have to enlarge pump capacity that the amount of electrocasting liquid dipping supplied in the cathode case 16 at the time of electrocrystallization must be made to increase, it is necessary to make it the value mentioned above.

[0060] Therefore, while being able to make it unnecessary to make a power surge into 0, 3-0, and about 5V, and to enlarge installed capacity of the rectifier by setting up in this way, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. On the other hand, form a dashboard 44 between the cathode case 16 and \*\*\*\*\* 11, and while arranging the upper limit section of this dashboard 44 so that it may become the same height as up opening of the cathode case 16, the lower limit section is caudad arranged rather than the lower limit section of the cathode case 16. A slide member 45 is formed so that the periphery upper limit section of \*\*\*\*\* 11 may consist of up opening of the cathode case 16 caudad about 5-15mm, and electrocasting liquid is made to flow out of this slide member 45.

[0061] Thus, the constituted reason is explained below. Since a point defect, a \*\*\*\* defect, etc. will be produced at the time of image formation, such as a copying machine, facsimile, and a printer, if it is in an organic photo conductor, and a projection, a pinhole, or a pit is formed in the outside surface of a base 2 at the time of an electroforming process, it is necessary to add and electrocast a surfactant in electrocasting liquid so that an outside-surface defect may not arise. And since this activator has fizz, it foams so much at the time of churning for improving a flow of electrocasting liquid, and it will be in a wrap condition about a electrocasting oil level at it.

[0062] In order to supply air between the cylindrical master 16 and a diaphragm 19 in order to use the cylinder-like cathode case 16 and to improve the liquid stirring effect at the time of electrocasting in this example, and to agitate, for circulation only with the liquid with which \*\*\*\*\* besides a diaphragm 19 passes a diaphragm, elevated-temperature liquid will pass a diaphragm 19, and will go up, and great time amount will be taken for the temperature distribution in \*\* to equalize.

[0063] And in order that the ununiformity of these temperature distribution may prevent the current which goes to cathode from an anode plate, various faults, such as being hard coming to release an endless-like member from mold, will be started from the concentration or the cylindrical master of a current to reduction in compressive stress, ununiformity-izing of thickness distribution, and the edge of the cylindrical master 13 on the electrocrystallization film. In order to prevent that such fault occurs and to use the cathode case 16 efficiently in this example, the flow of the electrocasting liquid supplied in \*\*\*\*\* 11 could make the start of the temperature in \*\*\*\*\* 11 prompt, without starting the ununiformity of temperature distribution, and further, in order to make a lot of bubbles generated with the surface active agent added by electrocasting liquid at the time of Ayr bubbling flow out smoothly, the dashboard 44 which takes the arrangement condition mentioned above has formed. For this reason, electrocasting \*\*\*\* which passed the electrocasting liquid and the diaphragm 19 which passed through the inside of the cathode case 16, and were overflowed from the upper limit section of this case 16 will descend toward the lower limit section of a dashboard 44 altogether, and this liquid that descended flows out of slide member 45 upper limit of \*\*\*\*\* 11 easily. And the liquid which flowed out outside flows back the 1st stock layer 34 through an excurrent canal 35.

[0064] Consequently, the time when it can prevent that the flow of the electrocasting liquid supplied in \*\*\*\*\* 11 starts the ununiformity of temperature distribution can make the start of the temperature in \*\*\*\*\* 11 prompt. Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard 44 top can be made to be able to overflow and it can be made to flow out of slide member 45 upper limit outside smoothly.

[0065] In addition, in this example, although the diaphragm 19 is made into 1-fold structure, as shown not only in this but in drawing 6, diaphragms 51 and 52 may be arranged in the perimeter of a cylindrical master at a predetermined spacing \*\*\*\*\* duplex. In this case, the permeability of the diaphragm 52 arranged outside is set as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>. If it does in this way, the electrocasting liquid supplied to the inner circumference section of the inside diaphragm 51 and the electrocasting liquid besides the outside diaphragm 52 are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of the inside diaphragm 51 can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition can fully be secured.

[0066] Moreover, in this permeability, it is few, and covering to an electrocrystallization current can be slight, or it can make a power surge 0 and less than [ 1V ], and can make installed capacity of a rectifier still smaller. Moreover, in this example, although the endless-like member is applied to the joint-less flexibility nickel belt of an organic photo conductor, as shown not only in this but in drawing 7, you may apply to the nickel sleeve 54 of the roller for development toner conveyance.

[0067] Also in this case, RZ 0, 2-0 and the 8-micrometer front face 56 can be easily formed by the surface roughness of the thickness 0 formed in the front face of 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, the 3-micrometer main stratum 55, and its main stratum in thickness by the manufacture approach which was mentioned above, 2-3 micrometers, and a diffuse reflector condition. And by forming in this way, without making it enter on the minute concave convex on a surface layer 56, the development toner T with a particle size of 5-15 micrometers which carried out frictional electrification can be conveyed smoothly, and can be developed.

[0068] Namely, since particle size may make a toner particle detailed by the repeat of a development process, and friction and it may enter into the concave heights on the front face of a developing roller, usually The development toner T can be smoothly conveyed by what (as effective value, they are RZ 0, 3-0 and 5 micrometers) the surface roughness of this surface layer 56 is adjusted to RZ 0, 2-0 and about 8 micrometers for, without making it enter on the minute concave convex on a surface layer 56.

[0069] Moreover, if it states from such a viewpoint, also when a base 2 is used as a conveyance belt, by setting it as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, coefficient of friction with a conveyance object can be enlarged, and smooth conveyance can be performed.

[0070]

[Effect of the Invention] In using an endless-like member as a member accompanied by repeat deformation of conveyance belts, organic photo conductors, etc., such as a copying machine, facsimile, or a printer, according to invention according to claim 1 Also when the main stratum fabricated by SURUFAMIRE acid nickel electrochemical molding deforms the surface layer by which the use accompanied by deformation was formed on this main stratum 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum, endurance does not get worse.

[0071] Moreover, since a surface layer is set as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, it acts as the diffusing surface to the light source for image formation write-in [ optical ], a moire image and a multiple echo image are not formed, and a good image can be formed. Moreover, in using it as an organic photo conductor base, adhesion becomes good to the undercoating layer used as the surface layer of a diffuse reflector condition with \*\* on this surface layer at a process with \*\*\*\*\*\*, and a defect with \*\* does not occur. Moreover, in order to make width of face of a photo conductor into min, even when an unnecessary width-of-face edge is cut in a field with \*\*\*\*\*\*, exfoliation cannot take place easily. Moreover, while being able to reduce the light-scattering agent of an under-coating layer, an under-coating layer can be made thin.

[0072] Furthermore, in the image formation process of a photo conductor, since front-face nature will be expanded when it has RZ 0, 2-0 and 8-micrometer surface roughness, since between a photo conductor and an electric conduction base is ohmic contact, are recording of rest potential can decrease and a clear image can be obtained. According to invention according to claim 2, the solution temperature of the range of 10-50mm around the cylindrical master 16 can be easily adjusted to predetermined temperature, and the surface layer of surface roughness RZ 0, 2-0 and a 8-micrometer diffuse reflection film condition can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding, without reducing solution temperature and changing the component of electrocasting liquid.

[0073] Moreover, since an Ayr bubbling means to agitate with air the electrocasting liquid supplied in a supply means to supply electrocasting liquid toward the upper limit section from the lower limit section of a cathode case, and a cathode case is established, the temperature of electrocasting supplied in a cathode case can be equalized, and the surface roughness of a surface layer can be equalized easily. Even if electrocasting liquid is a low flow rate (a part for for example, 5 - 20L/), electrocasting liquid can be made to be able to overflow from the upper limit section of a cathode case, and the bubble generated by air bubbling can be made to flow out of the upper limit section of a cathode case easily, while being able to distribute the volume supplied in a cathode case to homogeneity from the lower limit section of a cylindrical master to the upper limit section according to invention according to claim 3. Moreover, while pressing down the power surge to the electrocrystallization

current by the diaphragm to 0 and about 5V, the amount of electrocasting liquid dipping at the time of electrocrystallization can be reduced.

[0074] Consequently, while being able to make it unnecessary to enlarge installed capacity of a rectifier, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. According to invention according to claim 4, the electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition can fully be secured.

[0075] According to invention according to claim 5, all the electrocasting \*\*\*\* that passed the electrocasting liquid and the diaphragm which passed through the inside of a cathode case and were overflowed from the upper limit section of this case can be dropped toward the lower limit section of a dashboard, and this liquid that descended can be made to flow out of the periphery section upper limit of \*\*\*\*\* easily. Consequently, while being able to prevent that the flow of the electrocasting liquid supplied in \*\*\*\*\* starts the ununiformity of temperature distribution, the start of the temperature in \*\*\*\*\* can be made prompt.

[0076] Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard top can be made to be able to overflow and it can be made to flow out of the periphery upper limit of \*\*\*\*\* outside smoothly.

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**TECHNICAL FIELD**

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**[Industrial Application]** This invention relates to the joint-less flexibility endless-like member used for the base of the organic photo conductor used for a copying machine, facsimile, a printer, etc., and the manufacturing installation of the endless-like member in detail about a joint-less flexibility endless-like member and the manufacturing installation of the endless-like member.

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PRIOR ART

[Description of the Prior Art] As an approach of fabricating the joint-less flexibility endless-like member used for the base of an organic photo conductor etc. from the former by nickel amiosulfonate electrochemical molding, it is known by JP,3-17289,A, JP,3-17290,A, JP,3-17291,A, etc., for example.

[0003] He is trying for this thing to deposit a electrocasting sleeve on this master by performing honing using a glass bead by using the master for electroforming (metal mold) in which the irregularity of 5mm or less of RZ abbreviation was formed. Moreover, as an approach of sampling a electrocasting sleeve from a master, by adding brighteners, such as saccharin sodium, to electrocasting liquid as a compressive-stress agent, compressive stress is given to a electrocasting sleeve, and by making it become large 10-20 micrometers rather than a electrocasting master, or heating and enlarging the thermal expansion and contraction of a master and a sleeve, a sleeve enlarges path clearance of a sleeve and a master, or is carrying out using cooling water or a sleeve omission medium etc.

[0004] Thus, he is trying to obtain the electrocasting sleeve by which the irregularity formed on the master was copied at the rear face. Moreover, after sampling from a master the sleeve electroformed in addition to this, it is also made to perform crepe plating and compound plating of ceramic impalpable powder to the sleeve front face at another process. In addition, as mentioned above, as an approach of processing irregularity, chemical etching, laser beam machining, a grinding process, or polish processing by the wrapping paper is performed to the electrocasting master, and in order to obtain the granularity of a electrocasting sleeve front face, he is trying to adjust the irregularity of the front face of a electrocasting master.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] In using an endless-like member as a member accompanied by repeat deformation of conveyance belts, organic photo conductors, etc., such as a copying machine, facsimile, or a printer, according to invention according to claim 1 Also when the main stratum fabricated by SURUFAMIRE acid nickel electrochemical molding deforms the surface layer by which the use accompanied by deformation was formed on this main stratum 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum, endurance does not get worse.

[0071] Moreover, since a surface layer is set as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, it acts as the diffusing surface to the light source for image formation write-in [ optical ], a moire image and a multiple echo image are not formed, and a good image can be formed. Moreover, in using it as an organic photo conductor base, adhesion becomes good to the undercoating layer used as the surface layer of a diffuse reflector condition with \*\* on this surface layer at a process with \*\*\*\*\*, and a defect with \*\* does not occur. Moreover, in order to make width of face of a photo conductor into min, even when an unnecessary width-of-face edge is cut in a field with \*\*\*\*\*, exfoliation cannot take place easily. Moreover, while being able to reduce the light-scattering agent of an under-coating layer, an under-coating layer can be made thin.

[0072] Furthermore, in the image formation process of a photo conductor, since front-face nature will be expanded when it has RZ 0, 2-0 and 8-micrometer surface roughness, since between a photo conductor and an electric conduction base is ohmic contact, are recording of rest potential can decrease and a clear image can be obtained. According to invention according to claim 2, the solution temperature of the range of 10-50mm around the cylindrical master 16 can be easily adjusted to predetermined temperature, and the surface layer of surface roughness RZ 0, 2-0 and a 8-micrometer diffuse reflection film condition can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding, without reducing solution temperature and changing the component of electrocasting liquid.

[0073] Moreover, since an Ayr bubbling means to agitate with air the electrocasting liquid supplied in a supply means to supply electrocasting liquid toward the upper limit section from the lower limit section of a cathode case, and a cathode case is established, the temperature of electrocasting supplied in a cathode case can be equalized, and the surface roughness of a surface layer can be equalized easily. Even if electrocasting liquid is a low flow rate (a part for for example, 5 - 20L/), electrocasting liquid can be made to be able to overflow from the upper limit section of a cathode case, and the bubble generated by air bubbling can be made to flow out of the upper limit section of a cathode case easily, while being able to distribute the volume supplied in a cathode case to homogeneity from the lower limit section of a cylindrical master to the upper limit section according to invention according to claim 3. Moreover, while pressing down the power surge to the electrocrystallization current by the diaphragm to 0 and about 5V, the amount of electrocasting liquid dipping at the time of electrocrystallization can be reduced.

[0074] Consequently, while being able to make it unnecessary to enlarge installed capacity of a rectifier, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. According to invention according to claim 4, the electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition can fully be secured.

[0075] According to invention according to claim 5, all the electrocasting \*\*\*\* that passed the electrocasting liquid and the diaphragm which passed through the inside of a cathode case and were overflowed from the upper limit section of this case can be dropped toward the lower limit section of a dashboard, and this liquid that descended can be made to flow out of the periphery section upper limit of \*\*\*\*\* easily. Consequently, while being able to prevent that the flow of the electrocasting liquid supplied in \*\*\*\*\* starts the ununiformity of temperature distribution, the start of the temperature in \*\*\*\*\* can be made prompt.

[0076] Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard top can be made to be able to overflow and it can be made to flow out of the periphery upper limit of \*\*\*\*\* outside smoothly.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, since brighteners, such as saccharin sodium, were added in order to make a electrocasting sleeve easy to extract from a electrocasting master if it was in endless-like members, such as such a conventional electrocasting sleeve, when the use accompanied by deformation of a sleeve was repeated, there was a problem that the endurance will get worse very much.

[0006] That is, when brighteners, such as saccharin sodium, are added, a sleeve can be easily sampled from a electrocasting master, but on the other hand the operation which is going to graduate electrocasting master surface roughness in response to the effect of a brightener takes place to coincidence, and a electrocasting master front face must be made coarser than granularity required for a sleeve front face. It is fine about 5 micrometers and, specifically, the direction of surface becomes surface roughness 0, 1-Rz 0, and gloss and a thing with smooth nature from the rear face of a sleeve.

[0007] And since it is necessary to secure this inclination 10 micrometers or more when the straightness of a master and a master of the path clearance between sleeves is set to 0, in order to draw out a sleeve easily from a electrocasting master, when the path of a electrocasting master becomes less than [ phi40mm ], it must become in the direction which strengthens compressive stress more, and must make the addition of a brightener increase further.

[0008] For this reason, many sulfur comes to be contained in the film which carries out electrocrystallization, and the film degree of hardness as a sleeve will become high, and, on the whole, will become weak. Consequently, when the use accompanied by deformation of a sleeve was repeated, that endurance got worse very much, and when used for the base of an organic photo conductor, the belt for toner conveyance, etc., there was a problem that that function could not fully be demonstrated.

[0009] Moreover, it was required to remove and graduate a minute ripple component from the granularity formed in the master front face, and in order to have drawn out the sleeve easily from the electrocasting master, since it was necessary to carry out polish processing of the master front face with impalpable powder, such as a calcium carbonate and an aluminum oxide, there was a problem that the cost for obtaining a electrocasting sleeve will increase.

[0010] Invention according to claim 1 then, by forming thickness 0 and an about 2-3-micrometer surface layer with the granularity of a diffuse reflector condition in the front face of the main stratum of an endless-like member Also when the use accompanied by deformation is repeated, while being able to prevent that endurance gets worse, also when it is used for an organic photo conductor, the belt for toner conveyance, etc., it aims at offering the joint-less flexibility endless-like member which can fully demonstrate the function.

[0011] Invention according to claim 2 aims at offering the manufacturing installation of the joint-less flexibility endless-like member which can form easily RZ 0, 2-0 and a 8-micrometer surface layer on the surface of a main stratum by the surface roughness of thickness 0, 2-3 micrometers, and a diffuse reflector condition. Even when electrocasting liquid is supplied few in a cathode case, invention according to claim 3 The bubble which was made to overflow electrocasting liquid from up opening of this case, and was generated by Ayr bubbling can be made to flow out of cathode case up opening easily. While being able to prevent a bubble adhering to the upper limit part of an endless-like member, and soiling this endless-like member etc., it aims at offering the manufacturing installation of small [ which can lessen capacity of the feed pump of electrocasting liquid ], and a low cost joint-less flexibility endless-like member.

[0012] Invention according to claim 4 for the purpose of invention according to claim 3 in addition, by making a diaphragm into double structure The electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated. The temperature of

the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up. It aims at offering the manufacturing installation of a joint-less flexibility endless-like member which can fully secure the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition.

[0013] While invention according to claim 5 can supply electrocasting liquid toward up opening from the inner circumference lower limit section of a cathode case, making the temperature distribution of the electrocasting liquid supplied to the interior of a cathode case equalize It aims at offering the manufacturing installation of a joint-less flexibility endless-like member which it can dissociate [ manufacturing installation ] from electrocasting liquid and can make the bubble which was made to overflow electrocasting liquid from up opening of this case, and was generated by Ayr bubbling flow out easily out of \*\*\*\*\*.

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MEANS

[Means for Solving the Problem] In the joint-less flexibility endless-like member which is fabricated by nickel amiosulfonate electrochemical molding and used for the base of an organic photo conductor, the sleeve for development toner conveyance, etc. in order that invention according to claim 1 may solve the above-mentioned technical problem the surface roughness of the thickness 0 by which thickness was formed in the front face of 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, a 3-micrometer main stratum, and its main stratum, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and a 8-micrometer surface layer -- since -- it is characterized by becoming.

[0015] In order that invention according to claim 2 may solve the above-mentioned technical problem, it is the manufacturing installation of a flexible endless-like member according to claim 1. \*\*\*\*, The cylindrical master for electroforming by which it was extended and prepared in the vertical direction in this \*\*\*\*, and the minute concave convex was formed in the front face, The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of \*\*\*\* into a positive-negative pole and \*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part, It goes to up opening from the inner circumference lower limit section of this cathode case. The supply means which can supply electrocasting liquid, It is characterized by having an Ayr bubbling means to agitate with air the electrocasting liquid supplied in said cathode case, and the adjustment device which adjusts the temperature of the electrocasting liquid supplied in said cathode case.

[0016] In invention according to claim 2, said diaphragm is arranged in the perimeter of a cylindrical master by one-fold, and invention according to claim 3 is characterized by setting the permeability of this diaphragm per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second, in order to solve the above-mentioned technical problem. Invention according to claim 4 is characterized by setting the permeability of the diaphragm by which said diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\* duplex, and was arranged outside as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup> in invention according to claim 2, in order to solve the above-mentioned technical problem.

[0017] In invention given in any they are, a dashboard is formed between said cathode cases and \*\*\*\*, in order that invention according to claim 5 may solve the above-mentioned technical problem -- claims 2-4 -- this dashboard While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case. It is formed so that the periphery upper limit section of said \*\*\*\* may consist of up opening of a cathode case caudad about 5-15mm, and it is characterized by making it make electrocasting liquid flow out of this periphery upper limit section.

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## OPERATION

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[Function] the surface roughness of the thickness 0 by which the endless-like member was formed in the front face of 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, a 3-micrometer main stratum, and its main stratum in thickness in invention according to claim 1, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and a 8-micrometer surface layer -- since -- it is constituted. Therefore, also when the main stratum fabricated by nickel amiosulfonate electrochemical molding when an endless-like member was used as a member accompanied by repeat deformation of conveyance belts, organic photo conductors, etc., such as a copying machine, facsimile, or a printer, deforms the surface layer by which the use accompanied by deformation was formed on this main stratum 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum, endurance does not get worse.

[0019] Moreover, since a surface layer is set as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, it acts as the diffusing surface to the light source for image formation write-in [optical], a moire image and a multiple echo image are not formed, and a good image can be formed.

Moreover, in using it as an organic photo conductor base, adhesion becomes good to the undercoating layer used as the surface layer which has the granularity of a diffuse reflector condition with \*\* on this surface layer at a process with \*\*\*\*\*\*, and a defect with \*\* does not occur. Moreover, in order to make width of face of a photo conductor into min, even when an unnecessary width-of-face edge is cut in a field with \*\*\*\*\*\*, exfoliation cannot take place easily. Moreover, while being able to reduce the light-scattering agent of an under-coating layer, an under-coating layer can be made thin.

[0020] Furthermore, since front-face nature will be expanded when it has RZ 0, 2-0 and 8-micrometer surface roughness, since between a photo conductor and an electric conduction base is ohmic contact when applied to the image formation process of a photo conductor, are recording of rest potential can decrease and a clear image can be obtained. The cylindrical master for electroforming which is prepared in \*\*\*\*\* and extends in the vertical direction in invention according to claim 2, The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of \*\*\*\*\* into a positive-negative pole and \*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part, It has the adjustment device and \*\* which adjust the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of a cathode case.

[0021] Thus, if being constituted is in the approach of manufacturing the joint-less flexibility endless-like member used for the base of an organic photo conductor etc. by nickel amiosulfonate electrochemical molding, it is for preventing copying at the rear face of the granularity base of the field of a cylindrical master, and the rear-face granularity usually becoming fine under the effect of the brightener for compressive-stress generating for releasing the deposit film from mold from a \*\*\*\*\* master (saccharin) etc., and becoming a glossy surface.

[0022] That is, the surface layer of surface roughness RZ 0, 2-0 and a 8-micrometer diffuse reflection film condition can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding by adjusting easily the solution temperature of the range of 10-50mm around a cylindrical master to predetermined temperature, without reducing solution temperature and changing the component of electrocasting liquid. Moreover, in this invention, since an Ayr bubbling means to agitate with air the electrocasting liquid supplied in a supply means to supply electrocasting liquid toward the upper limit section from the lower limit section of a cathode case, and a cathode case is established, the temperature of electrocasting supplied in a cathode case is equalized, and the surface roughness of a surface layer is equalized easily.

[0023] In invention according to claim 3, a diaphragm is arranged in the perimeter of a cylindrical master by one-fold, and the permeability of this diaphragm is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second. Thus, it is because the permeability for performing moderate \*\*\*\* for a cathode case distributing the electrocasting liquid supplied to the interior to homogeneity from the lower limit section of a cylindrical master to the upper limit section is required for being constituted. Moreover, a bubble generates the inside of a cathode case with the surfactant in electrocasting liquid by carrying out Ayr bubbling. It is carried out, after this bubble was accumulated into the cathode case, and dispersed or has adhered to the cylindrical master upper part. In case a cylindrical master is washed, while this bubble will soil a penetrant remover, after floating to a penetrant remover, it is for preventing that the fault that will carry out the reattachment to a front face and a stain etc. will occur occurs.

[0024] Namely, while being able to distribute to homogeneity the volume supplied in a cathode case by setting the permeability of a diaphragm per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second from the lower limit section of a cylindrical master to the upper limit section Even if electrocasting liquid is a low flow rate (for example, 5 - 20L / part; however L show a liter), electrocasting liquid can be in an overflow condition from the upper limit section of a cathode case, and the bubble generated by air bubbling can be made to flow out of the upper limit section of a cathode case easily.

[0025] Moreover, the permeability of a diaphragm was set per [ 0 ] two and as a 5-3cm<sup>3</sup>/second 1cm for reducing the amount of electrocasting liquid dipping at the time of electrocrystallization, while pressing down the power surge to the electrocrystallization current by the diaphragm to 0 and about 5V. If set as the numeric value beyond this, pump capacity must be enlarged that the amount of electrocasting liquid dipping supplied in a cathode case at the time of electrocrystallization must be made to increase.

[0026] In this invention, while being able to make it unnecessary to enlarge installed capacity of a rectifier by setting up in this way, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. In invention according to claim 4, the permeability of the diaphragm by which the diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\*\* duplex, and was arranged outside is set as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>.

[0027] Therefore, the electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition can fully be secured. By invention according to claim 5, a dashboard is formed between a cathode case and \*\*\*\*\*. This dashboard While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case. It is formed so that the periphery upper limit section of \*\*\*\*\* may consist of up opening of a cathode case caudad about 5-15mm, and electrocasting liquid is flowed out of this periphery upper limit section.

[0028] Thus, the constituted reason is explained below. Since a point defect, a \*\*\*\* defect, etc. will be produced at the time of image formation, such as a copying machine, facsimile, and a printer, if a projection, a pinhole, or a pit is formed in the outside surface of these belts or a sleeve at the time of an electroforming process when an endless-like member is used as the joint-less nickel belt for organic photo conductor bases, or a electrocasting sleeve for toner conveyance, it is necessary to add and electrocast a surfactant in electrocasting liquid so that an outside-surface defect may not arise.

[0029] And since this activator has fizz, it foams so much at the time of churning for improving a flow of electrocasting liquid, and it will be in a wrap condition about a electrocasting oil level at it. And in order to supply air between a cylindrical master and a diaphragm in order to use a cylinder-like cathode case and to improve the liquid stirring effect at the time of electrocasting in this invention, and to agitate, for circulation only with the liquid with which \*\*\*\*\* besides a diaphragm passes a diaphragm, elevated-temperature liquid will pass a diaphragm, and will go up, and great time amount will be taken for the temperature distribution in \*\* to equalize.

[0030] And in order that the ununiformity of these temperature distribution may prevent the current which goes to cathode from an anode plate, various faults, such as being hard coming to release an endless-like member from mold, will be started from the concentration or the cylindrical master of a current to reduction in compressive stress, ununiformity-izing of thickness distribution, and the edge of a cylindrical master on the

electrocrystallization film. Since it is such, in order to use a cathode case efficiently, in invention, it is necessary for the flow of the electrocasting liquid supplied in \*\*\*\*\* to be able to make the start of the temperature in \*\*\*\*\* prompt, without starting the ununiformity of temperature distribution, and to make a lot of bubbles generated with the surface active agent further added by electrocasting liquid at the time of Ayr bubbling flow out smoothly.

[0031] Therefore, by forming the periphery upper limit section of \*\*\*\*\* so that it may consist of up opening of a cathode case caudad about 5-15mm while forming the diaphragm mentioned above in this invention All the electrocasting \*\*\*\* that passed the electrocasting liquid and the diaphragm which passed through the inside of a cathode case and were overflowed from the upper limit section of this case can be dropped toward the lower limit section of a dashboard, and this liquid that descended can be made to flow out of the periphery section upper limit of \*\*\*\*\* easily.

[0032] Consequently, while being able to prevent that the flow of the electrocasting liquid supplied in \*\*\*\*\* starts the ununiformity of temperature distribution, the start of the temperature in \*\*\*\*\* can be made prompt. Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard top can be made to be able to overflow and it can be made to flow out of the periphery upper limit of \*\*\*\*\* outside smoothly.

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EXAMPLE

[Example] Hereafter, this invention is explained based on a drawing. drawing 1 R>1-7 -- claims 1-5 -- it is drawing showing the joint-less flexibility endless-like member concerning invention given in any they are, and one example of the manufacturing installation of the endless-like member, and the example which applied the endless-like member of this invention to the joint-less nickel belt for organic photo conductor bases used for a copying machine, facsimile, a printer, etc. is shown.

[0034] In addition, the external view of the organic photo conductor which used the nickel belt when drawing 1 applies the endless-like member of this invention to a joint-less flexibility nickel belt as a base, the sectional view of the functional discrete type of the organic photo conductor with which drawing 2 used the flexible nickel belt, and drawing 3 are the sectional views of the flexible nickel belt fabricated by the nickel amiosulfonate electrochemical molding of this invention.

[0035] First, a configuration is explained. In drawing 1 , 1 is an organic photo conductor, and this organic photo conductor 1 consists of the conductive base 2, the under-coating layer 3, electrification and an optical carrier generating layer 4 (following, only optical carrier generating layer), and a charge transportation layer 5, as shown in drawing 2 . The under-coating layer 3 is for making electrification and the optical carrier generating layer 4 into homogeneity with \*\* on a base 2, and the charge transportation layer 5 moves efficiently the carrier generated in optical carrier \*\*\*\*\* 4 which occupies most amounts of electrifications to a front face, and eliminates an electrification charge.

[0036] If it is in this organic photo conductor used for a digital copier etc., it is ideal to form a latent image, to perform toner development by irradiating semiconductor laser at the electrified photo conductor, and for the laser beam in a semiconductor laser exposure process to be altogether absorbed in the optical carrier generating layer 4, and to become a positive/negative carrier, but if it \*\*\*\*\* in an image formation process, it will not become effective on image formation to thicken the optical carrier generating layer 4 and to make all light absorb.

[0037] For this reason, as for the optical carrier generating layer 4 or the under-coating layer 3, it is desirable to make it thin as much as possible according to a process, a part of laser beam (an arrow head L shows) in which the latent image was formed penetrates the optical carrier generating layer 4 and under-coating equipment 3, it reaches a base 2, and they reflect it. Since the under-coating layer 3 is penetrated again, resorption is carried out with the rear face of the optical carrier generating layer 4 and fault pattern [ an interference fringe, a multiple echo pattern, etc. ] image formation is made, this reflected light makes the under-coating layer 3 distribute titanium oxide impalpable powder, alumina impalpable powder, etc. as a light-scattering agent.

[0038] Since this impalpable powder causes the rise of rest potential for high resistance, making it add in a binder and forming an electric conduction agent is often performed. The under-coating layer 3 by which the light-scattering agent was distributed cannot be made not much thick on improvement in the speed of an image process, but is too divided into the component of reflection in dispersion transparency and base 2 front face with reflection by the interface with the optical carrier generating layer 4 to the laser beam which forms a latent image.

[0039] And if a light-scattering agent is used so much, a reflective component will become strong by the interface with the optical carrier generating layer 4, and the gradation nature of an image will get worse from the resorption in optical carrier generating layer 4 rear face, or it will become causes, such as dotage of an image. For this reason, although moderate light scattering and transparency absorption are needed, since the thickness which deserves absorption of an image process on improvement in the speed is not obtained, the under-coating layers 3 will need to be again scattered about to the transmitted light in base 2 front face.

[0040] In order to prevent this, as shown in drawing 3, the base 2 consists of a main stratum 6 and a surface layer 7 at this example. The thickness by which electrocrystallization was carried out in 50-60-degree C nickel amiosulfonate electrocasting liquid Namely, 20-40 micrometers, The surface layer 7 which has a diffuse reflector succeeding degrees of hardness 400-HV 500, granularity RZ 0, 05-0 of rear-face 6a, and the front face of the main stratum 6 formed in 3 micrometers, respectively is formed. The surface layer 7 is formed in RZ 0, 2-0, 8 micrometers, and 20 - 90% of diffuse reflection factors by the surface roughness of thickness 0, 2-3 micrometers, and a diffuse reflector condition.

[0041] thus, the transmitted light mentioned above when constituted -- again -- dispersion -- effective -- it can act . Drawing 4 and 5 are drawings showing the equipment which manufactures the base 2 mentioned above. First, a configuration is explained. In drawing 4, 11 is \*\*\*\*\* (only henceforth \*\*\*\*\*) and the titanium case 12 by the side of an anode plate is established in this \*\*\*\*\* 11. Moreover, in \*\*\*\*\* 11, the cylindrical master 13 for electroforming for carrying out electrocrystallization of the nickel belt is formed, this cylindrical master 13 extends in the vertical direction, and while the end section of rod 13a is attached in the upper limit section, the minute concave convex is formed in the front face.

[0042] The other end of this rod 13a is attached in the motor 14, and the cylindrical master 13 rotates by the motor 14. This motor 14 is attached in the drive which is not illustrated while being prepared in the guide member 15 free [ sliding ], and is guided in the vertical direction along with the guide member 15 by driving to a drive.

[0043] Moreover, the cathode case 16 by the side of cathode is arranged in the perimeter of the cylindrical master 13, and this cathode case 16 is prepared in the interior of the titanium case 12 while it is isolated about 10-50mm with the cylindrical master 13 and is arranged in the perimeter of this master on the same axle. This cathode case 16 is constituted as shown in drawing 5 . In drawing 5, 17 is the lower limit flange 17 attached in \*\*\*\*\* 11, and the inhalant canal mentioned later is connected to this lower limit flange 17. The case frame 18 is formed on this lower limit flange 17, and the object for the outflow of electrocasting liquid and opening 18a for energization are formed in the upper part of this case frame 18. Moreover, this case frame 18 is supporting two or more diaphragms 19 which consist of cloth, such as polypropylene or vinyl chloride, this diaphragm 19 is isolated about 10-50mm with the cylindrical master 13, and is prepared in the perimeter of this master 13 one-fold, and a batch requires the cylindrical master 13 from a perimeter.

[0044] Moreover, while the upper part is being fixed to the case frame 18 by the annular clamping flange 20, that permeability is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second, and when electrocasting \*\*\* is supplied between the cylindrical masters 13, this diaphragm 19 is constituted so that this electrocasting liquid may be made to overflow from a clamping flange 20. Moreover, the air blow-off member 21 is formed in the lower limit side of the case frame 18, this blow-off member 21 is connected to the air supply 25 through the filter 22, the pressure reducer 23, and the bulb 24, and the electrocasting liquid supplied between a diaphragm 19 and the cylindrical master 13 is agitated by supplying the air from the air supply 25 decompressed by the pressure reducer 23 between a diaphragm 19 and the cylindrical master 13. And this air blow-off member 21, the filter 22, the pressure reducer 23, the bulb 24, and the air supply 25 constitute the Ayr bubbling means 58.

[0045] Moreover, the inhalant canal 31 is connected to the lower limit flange 17, and this inhalant canal 31 is connected to the pump 32. This pump 32 is connected to 1st stock \*\* 34 by which sulfamic acid nickel-electroforming liquid was stocked through the bulb 33. While the electrocasting liquid which flowed into this stock \*\* 34 out of \*\*\*\*\* 11 through the excurrent canal 35 flows back and cooling this reflux with a cooling pipe 36, electrocasting liquid is kept warm at a heater 37 so that it may become 50-60 degrees C.

[0046] Moreover, this pump 32 is connected to 2nd stock \*\* 39 by which sulfamic acid nickel-electroforming liquid was stocked through the bulb 38. While the electrocasting liquid from 1st stock \*\* 34 is supplied to this stock \*\* 34 through a pump 40 and cooling this electrocasting liquid with a cooling pipe 41, electrocasting liquid is kept warm at a heater 42 so that it may become 30-40 degrees C.

[0047] Therefore, a pump 32 supplies the electrocasting liquid of different temperature stocked by 1st stock \*\* 34 or 2nd stock \*\* 39 switched by the bulb 33 or the bulb 38 between a diaphragm 19 and the cylindrical master 13 from the lower limit flange 17 (inner circumference lower limit section of a cathode case). These inhalant canals 31, a pump 32, a bulb 33, 1st stock \*\* 34, a cooling pipe 36, a heater 37, a bulb 38, 2nd stock \*\* 39, a cooling pipe 41, and a heater 42 constitute the adjustment device 59 which adjusts the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cathode case 16. An inhalant canal 31, a pump 32, a bulb 33, 1st stock \*\* 34, a bulb 38, and 2nd stock \*\* 39 constitute the supply means 60

which can supply electrocasting liquid toward up opening from the inner circumference lower limit section of the cathode case 16.

[0048] On the other hand, the dashboard 44 is formed between the cathode case 16 and \*\*\*\*\* 11, and while the upper limit section of this dashboard 44 is arranged so that it may become the same height as the fixed flange 20 (up opening) of the cathode case 16, the lower limit section is caudad arranged rather than the lower limit section of the cathode case 16. Moreover, it is constituted so that it may \*\*\*\* in the location where it is constituted in so that the slide member 45 may be formed in the periphery upper limit section of \*\*\*\*\* 11 and this slide member 45 may move in the vertical direction along with \*\*\*\*\* 11, and the upper limit section consists of a fixed flange 20 of the cathode case 16 caudad about 5-15mm, and may be fixed to \*\*\*\*\* 11 by 46 and the electrocasting liquid from the upper limit section may be flowed out.

[0049] Next, how to manufacture a base 2 by such manufacturing installation is explained. First, while supplying the electrocasting liquid which opened the bulb 33 wide, was stocked by the 1st stock layer 34 between the diaphragm 19 and the cylindrical master 13 from the inhalant canal 31 through the pump 32, and was adjusted to the temperature of 50-60 degrees C, air is supplied by part for the air blow-off tubing 21-5 - 10L/, and electrocasting liquid is agitated.

[0050] Moreover, 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, and the 3-micrometer main stratum 6 are formed in the front face of the cylindrical master 13 in thickness by setting up the electrocrystallization current at this time as 5 - 10 A/dm<sup>2</sup>, and setting up electrocrystallization time amount in 10 - 30 minutes. Since the rate of flow of electrocasting liquid becomes that electrocasting liquid is agitated by air and coincidence early at this time, there is no \*\* which a pit and desperation generate in a main stratum 6.

[0051] Subsequently, while carrying out adjustable [ of the electrocrystallization current ] to 0, 1 - 1 A/dm<sup>2</sup>, the electrocasting liquid which was stocked by the 2nd stock layer 39 between the diaphragm 19 and the cylindrical master 13 from the inhalant canal 31 through the pump 32, and was adjusted to the temperature of 30-40 degrees C is supplied by closing a bulb 33 and opening a bulb 38. At this time, if the skin temperature of the cylindrical master 13 will be in this electrocasting temperature and equilibrium, RZ 0, 2-0 and the 8-micrometer surface layer 7 will be formed in the front face of a main stratum 6 by the surface roughness of thickness 0, 2-3 micrometers, and a diffuse reflector condition by carrying out adjustable [ of the electrocrystallization current ] to 5 - 10 A/dm<sup>2</sup>.

[0052] That is, it descends to the temperature for obtaining surface roughness more nearly required than the temperature when forming a main stratum 6 for electrocasting temperature, and if electrocrystallization is carried out, the surface roughness of a diffuse reflector condition can be formed. As a result of the experiment, in order to obtain RZ0 and 2 micrometers, to obtain 40 degrees C, 6 A/dm<sup>2</sup>, RZ0, and 4 micrometers, to obtain 35 degrees C, 6 A/dm<sup>2</sup>, RZ0, and 6 micrometers and to obtain 30 degrees C, 6 A/dm<sup>2</sup>, RZ0, and 8 micrometers, 30 degrees C and 8 A/dm<sup>2</sup> were needed.

[0053] And it has been in the condition that it cannot be used that the boric acid component of nickel amiosulfonate electrocasting liquid deposits, that an electrocrystallization current concentrates on cylindrical master 13 edge, and it becomes difficult from the cylindrical master 13 to release a base 2 from mold, when compressive stress decreases and the stress-strain diagram to a main stratum 6 becomes large, below at the temperature mentioned above. In this example, thickness the base 2 of a flexible nickel belt Thus, 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, and the 3-micrometer main stratum 6, the surface roughness of the thickness 0 formed in the front face of the main stratum 6, 2-3 micrometers, and a diffuse reflector condition -- RZ 0, 2-0 and the 8-micrometer surface layer 7 -- since, since it constitutes Also when the organic photo conductor which has this base 2 deforms the surface layer 7 by which the use accompanied by deformation of a main stratum 6 was formed on this main stratum 6 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum 6, endurance does not get worse.

[0054] Moreover, since a surface layer 6 is set as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, it acts as the diffusing surface to the light source for image formation write-in [ optical ], a moire image and a multiple echo image are not formed, and a good image can be formed. Moreover, adhesion becomes good to the under-coating layer 3 used as the surface layer 7 which has the granularity of a diffuse reflector condition with \*\* on this surface layer at a process with \*\*\*\*\*\*, and a defect with \*\* does not occur. Moreover, in order to make width of face of a photo conductor into min, even when an

unnecessary width-of-face edge is cut in a field with \*\*\*\*\*\*, exfoliation cannot take place easily. Moreover, while being able to reduce the light-scattering agent of the under-coating layer 3, the under-coating layer 3 can be made thin.

[0055] Furthermore, in the image formation process of a photo conductor, since front-face nature will be expanded when it has RZ 0, 2-0 and 8-micrometer surface roughness, since between a photo conductor and the conductive base 2 is ohmic contact, are recording of rest potential can decrease and a clear image can be obtained. Moreover, in case the minute concave convex formed in the front face of the cylindrical master 13 when the electrocrystallization film was deposited to the cylindrical master 13 is copied at the rear face of a main stratum 6, under the effect of the brightener for compressive-stress generating for releasing the deposit film from mold from a \*\*\*\*\* master (saccharin) etc., the rear-face granularity becomes fine and serves as a glossy surface.

[0056] The energization which divides the inside of \*\*\*\*\* 11 into a positive-negative pole while being isolated about 10-50mm with the cylindrical master 13 and being arranged in the perimeter of this master 13 on the same axle in this example, While establishing the cathode case 16 where have the diaphragm 18 in which \*\*\*\* is possible, and opening 18a was formed in the upper part Since the adjustment device 59 which adjusts the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cathode case 16 is formed, The solution temperature of the range of 10-50mm around the cylindrical master 16 can be easily adjusted to predetermined temperature. The surface layer of surface roughness RZ 0, 2-0 and a 8-micrometer diffuse reflection film condition can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding, without reducing solution temperature and changing the component of electrocasting liquid.

[0057] moreover, since the electrocasting liquid supplied in the cathode case 16 is agitated with air while resembling the upper limit section from the lower limit section of the cathode case 16 and supplying electrocasting liquid, the temperature of electrocasting supplied in the cathode case 16 can be equalized, and the surface roughness of a surface layer 7 can be equalized easily. Moreover, the diaphragm 18 was arranged in the perimeter of the cylindrical master 13 one-fold, and the permeability of this diaphragm 18 is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second. Thus, it is because having constituted distributes to homogeneity the electrocasting liquid with which the cathode case 16 is supplied to the interior from the lower limit section of the cylindrical master 13 to the upper limit section, so the permeability for performing moderate \*\*\* is required. Moreover, a bubble generates the inside of the cathode case 16 with the surfactant in electrocasting liquid by carrying out Ayr bubbling. It is carried out, after this bubble was accumulated into the cathode case 16, and dispersed or has adhered to the upper part of the cylindrical master 16. In case the cylindrical master 13 is washed, while this bubble will soil a penetrant remover, after floating to a penetrant remover, it is for preventing that the fault that will carry out the reattachment to a front face and a stain etc. will occur occurs.

[0058] Namely, while being able to distribute to homogeneity the volume supplied in the cathode case 13 by setting the permeability of a diaphragm per [ 0 ] two and as a 5-3cm<sup>3</sup>/second 1cm from the lower limit section of the cylindrical master 13 to the upper limit section Even if electrocasting liquid is a low flow rate (a part for for example, 5 - 20L/), electrocasting liquid can be made to be able to overflow from the upper limit section of the cathode case 13, and the bubble generated by air bubbling can be made to flow out of the upper limit section of the cathode case 13 easily.

[0059] Moreover, by setting the permeability of a diaphragm 19 per [ 0 ] two and as a 5-3cm<sup>3</sup>/second 1cm, while pressing down the power surge to the electrocrystallization current by the diaphragm 19 to 0 and about 5V, the amount of electrocasting liquid dipping at the time of electrocrystallization can be reduced. However, if it is set as the numeric value beyond this, in order to have to enlarge pump capacity that the amount of electrocasting liquid dipping supplied in the cathode case 16 at the time of electrocrystallization must be made to increase, it is necessary to make it the value mentioned above.

[0060] Therefore, while being able to make it unnecessary to make a power surge into 0, 3-0, and about 5V, and to enlarge installed capacity of the rectifier by setting up in this way, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. On the other hand, form a dashboard 44 between the cathode case 16 and \*\*\*\*\* 11, and while arranging the upper limit section of this dashboard 44 so that it may become the same height as up opening of the cathode case 16, the lower limit section is caudad arranged rather than the lower limit section of the cathode case 16. A slide member 45 is formed so that the periphery upper limit section of \*\*\*\*\* 11 may consist of up opening of the cathode case 16

caudad about 5-15mm, and electrocasting liquid is made to flow out of this slide member 45.

[0061] Thus, the constituted reason is explained below. Since a point defect, a \*\*\* defect, etc. will be produced at the time of image formation, such as a copying machine, facsimile, and a printer, if it is in an organic photo conductor, and a projection, a pinhole, or a pit is formed in the outside surface of a base 2 at the time of an electroforming process, it is necessary to add and electrocast a surfactant in electrocasting liquid so that an outside-surface defect may not arise. And since this activator has fizz, it foams so much at the time of churning for improving a flow of electrocasting liquid, and it will be in a wrap condition about a electrocasting oil level at it.

[0062] In order to supply air between the cylindrical master 16 and a diaphragm 19 in order to use the cylinder-like cathode case 16 and to improve the liquid stirring effect at the time of electrocasting in this example, and to agitate, for circulation only with the liquid with which \*\*\*\*\* besides a diaphragm 19 passes a diaphragm, elevated-temperature liquid will pass a diaphragm 19, and will go up, and great time amount will be taken for the temperature distribution in \*\* to equalize.

[0063] And in order that the ununiformity of these temperature distribution may prevent the current which goes to cathode from an anode plate, various faults, such as being hard coming to release an endless-like member from mold, will be started from the concentration or the cylindrical master of a current to reduction in compressive stress, ununiformity-izing of thickness distribution, and the edge of the cylindrical master 13 on the electrocrystallization film. In order to prevent that such fault occurs and to use the cathode case 16 efficiently in this example, the flow of the electrocasting liquid supplied in \*\*\*\*\* 11 could make the start of the temperature in \*\*\*\*\* 11 prompt, without starting the ununiformity of temperature distribution, and further, in order to make a lot of bubbles generated with the surface active agent added by electrocasting liquid at the time of Ayr bubbling flow out smoothly, the dashboard 44 which takes the arrangement condition mentioned above has formed. For this reason, electrocasting \*\*\*\* which passed the electrocasting liquid and the diaphragm 19 which passed through the inside of the cathode case 16, and were overflowed from the upper limit section of this case 16 will descend toward the lower limit section of a dashboard 44 altogether, and this liquid that descended flows out of slide member 45 upper limit of \*\*\*\*\* 11 easily. And the liquid which flowed out outside flows back the 1st stock layer 34 through an excurrent canal 35.

[0064] Consequently, the time when it can prevent that the flow of the electrocasting liquid supplied in \*\*\*\*\* 11 starts the ununiformity of temperature distribution can make the start of the temperature in \*\*\*\*\* 11 prompt. Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard 44 top can be made to be able to overflow and it can be made to flow out of slide member 45 upper limit outside smoothly.

[0065] In addition, in this example, although the diaphragm 19 is made into 1-fold structure, as shown not only in this but in drawing 6, diaphragms 51 and 52 may be arranged in the perimeter of a cylindrical master at a predetermined spacing \*\*\*\*\* duplex. In this case, the permeability of the diaphragm 52 arranged outside is set as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>. If it does in this way, the electrocasting liquid supplied to the inner circumference section of the inside diaphragm 51 and the electrocasting liquid besides the outside diaphragm 52 are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of the inside diaphragm 51 can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate RZ 0, 2-0 and a 8-micrometer surface layer by the surface roughness of a diffuse reflection film condition can fully be secured.

[0066] Moreover, in this permeability, it is few, and covering to an electrocrystallization current can be slight, or it can make a power surge 0 and less than [ 1V ], and can make installed capacity of a rectifier still smaller. Moreover, in this example, although the endless-like member is applied to the joint-less flexibility nickel belt of an organic photo conductor, as shown not only in this but in drawing 7, you may apply to the nickel sleeve 54 of the roller for development toner conveyance.

[0067] Also in this case, RZ 0, 2-0 and the 8-micrometer front face 56 can be easily formed by the surface roughness of the thickness 0 formed in the front face of 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0, 05-0, the 3-micrometer main stratum 55, and its main stratum in thickness by the manufacture approach which was mentioned above, 2-3 micrometers, and a diffuse reflector condition. And by forming in this way, without making it enter on the minute concave convex on a surface layer 56, the development toner T with a particle size of 5-15 micrometers which carried out frictional electrification can be conveyed smoothly, and can be developed.

[0068] Namely, since particle size may make a toner particle detailed by the repeat of a development process, and friction and it may enter into the concave heights on the front face of a developing roller, usually The development toner T can be smoothly conveyed by what (as effective value, they are RZ 0, 3-0 and 5 micrometers) the surface roughness of this surface layer 56 is adjusted to RZ 0, 2-0 and about 8 micrometers for, without making it enter on the minute concave convex on a surface layer 56.

[0069] Moreover, if it states from such a viewpoint, also when a base 2 is used as a conveyance belt, by setting it as RZ 0, 2-0 and 8 micrometers by the surface roughness of a diffuse reflector condition, coefficient of friction with a conveyance object can be enlarged, and smooth conveyance can be performed.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] claims 1-5 -- it is drawing showing the joint-less flexibility endless-like member concerning invention given in any they are, and one example of the manufacturing installation of the endless-like member, and is the external view of the organic photo conductor which used the nickel belt when applying the endless-like member to a joint-less flexibility nickel belt as a base.

[Drawing 2] It is the sectional view of the functional discrete type of the organic photo conductor which used the flexible nickel belt.

[Drawing 3] It is the sectional view of the flexible nickel belt fabricated by the nickel amiosulfonate electrochemical molding.

[Drawing 4] It is the outline block diagram of the manufacturing installation.

[Drawing 5] It is the block diagram of the cathode case.

[Drawing 6] It is drawing showing other modes of a cathode case.

[Drawing 7] The mode which applied the endless-like member to the sleeve of the roller for development toner conveyance is shown, (a) is the block diagram of the conveyance roller, and (b) is the sectional view of the sleeve.

### [Description of Notations]

2 Base (Endless-like Member)

6 55 Main stratum

7 56 Surface layer

11 Electrocasting Layer

13 Cylindrical Master

16 Cathode Case

19, 51, 52 Diaphragm

44 Dashboard

54 Sleeve (Endless-like Member)

58 Ayr Bubbling Means

59 Adjustment Device

60 Supply Means

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[Translation done.]

## \* NOTICES \*

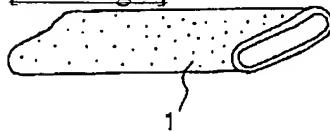
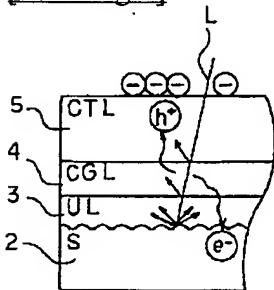
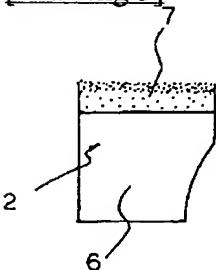
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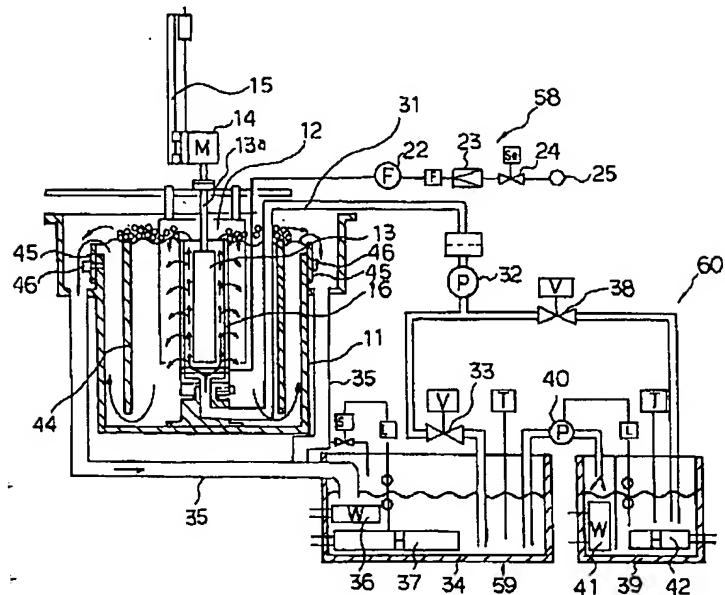
1. This document has been translated by computer. So the translation may not reflect the original precisely.
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3. In the drawings, any words are not translated.

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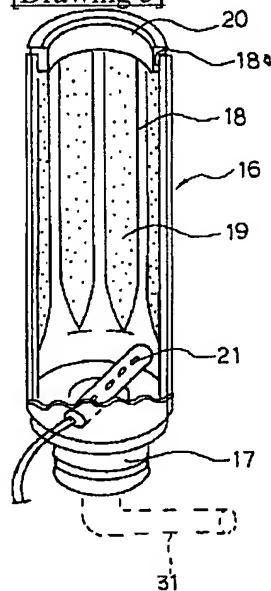
DRAWINGS

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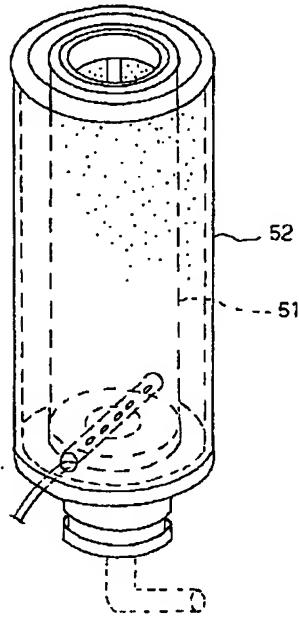
[Drawing 1][Drawing 2][Drawing 3][Drawing 4]



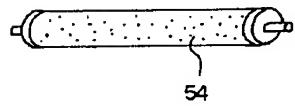
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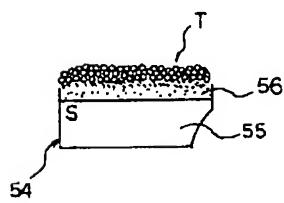
[Drawing 6]



[Drawing 7]  
( a )



( b )



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[Translation done.]

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## CORRECTION OR AMENDMENT

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C25D 1/02  
 G03G 5/10

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 G03G 5/10 B

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 [Filing Date] June 29, Heisei 12 (2000. 6.29)  
 [Procedure amendment 1]  
 [Document to be Amended] Specification  
 [Item(s) to be Amended] Claim  
 [Method of Amendment] Modification  
 [Proposed Amendment]  
 [Claim(s)]  
 [Claim 1] Rear-face granularity RZ1 and surface roughness RZ2 are RZ1<RZ2. Joint-less flexibility endless-like member characterized by having a relation.  
 [Claim 2] The joint-less flexibility endless-like member characterized by rear-face granularity RZ1 being 0.05-0.3 micrometers of ten granularity cross-section curvilinear average-of-roughness-height RZ.  
 [Claim 3] The joint-less flexibility endless-like member characterized by surface roughness RZ2 by the side of the front face of a member being 0.2-0.8 micrometers of ten granularity cross-section curvilinear average-of-roughness-height RZ.  
 [Claim 4] The joint-less flexibility endless-like member [ continuous at the time of electroforming ] according to claim 1, 2, or 3 which it was, and was carried out and was produced to coincidence.  
 [Claim 5] The joint-less flexibility endless-like member characterized by using a joint-less flexibility endless-like member according to claim 1, 2, 3, or 4 as a base.  
 [Claim 6] The joint-less flexibility endless-like member characterized by using a member according to claim 1, 2, 3, or 4 as an object for conveyance.  
 [Claim 7] In the joint-less flexibility endless-like member which is fabricated by nickel amiosulfonate electrochemical molding and used for the base of an organic photo conductor, the sleeve for development toner conveyance, etc., Thickness is the main stratum of 20-40 micrometers, degrees of hardness 400-HV 500, and 0.05 to 0.3

micrometer rear-face granularity RZ,

the surface roughness of 0.02-3 micrometers in thickness formed in the front face of the main stratum, and a diffuse reflector condition -- the surface layer of 0.2-0.8 micrometers of RZ -- since -- the joint-less flexibility endless-like member characterized by becoming.

[Claim 8] It is the manufacturing installation of a flexible endless-like member according to claim 7, Electroforming tub,

The cylindrical master for electroforming by which it was extended and prepared in the vertical direction in this electroforming tub, and the minute concave convex was formed in the front face,

The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of an electroforming tub into a positive-negative pole and \*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part,

It goes to up opening from the inner circumference lower limit section of this cathode case, and is the supply means which can supply electrocasting liquid,

An Ayr bubbling means to agitate with air the electrocasting liquid supplied in said cathode case,

The manufacturing installation of the joint-less flexibility endless-like member characterized by having the adjustment device which adjusts the temperature of the electrocasting liquid supplied in said cathode case.

[Claim 9] The manufacturing installation of the joint-less flexibility endless-like member according to claim 8 characterized by for said diaphragm being arranged in the perimeter of a cylindrical master by one-fold, and setting the permeability of this diaphragm as the JIS10.5-3cm<sup>3</sup>/second per cm<sup>2</sup>.

[Claim 10] The manufacturing installation of the joint-less flexibility endless-like member according to claim 8 characterized by setting the permeability of the diaphragm by which said diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\*\* duplex, and was arranged outside as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>.

[Claim 11] A dashboard is formed between said cathode cases and electroforming tubs,

While this dashboard is arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case, claims 8-10 characterized by being formed so that the periphery upper limit section of said electroforming tub may consist of up opening of a cathode case caudad about 5-15mm, and making it make electrocasting liquid flow out of this periphery upper limit section -- the manufacturing installation of a joint-less flexibility endless-like member given in any they are.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0010

[Method of Amendment] Modification

[Proposed Amendment]

[0010] Invention according to claim 1 to 3 then, by forming in the front face of the main stratum of an endless-like member the surface layer of the predetermined thickness which specified the granularity of a diffuse reflector condition Also when the use accompanied by deformation is repeated, while being able to prevent that endurance gets worse, also when it is used for an organic photo conductor, the belt for toner conveyance, etc., it aims at offering the joint-less flexibility endless-like member which can fully demonstrate the function. And in invention of claim 1, it is characterized by rear-face granularity RZ1 and surface roughness RZ2 having the relation of RZ1< RZ2. Moreover, by invention of claim 2, rear-face granularity RZ1 is 0.05-0.3 micrometers of ten granularity cross-section curvilinear average-of-roughness-height RZ. It is characterized by a certain thing. Furthermore, in invention of claim 3, it is characterized by surface roughness RZ2 by the side of the front face of a member being 0.2-0.8 micrometers of ten granularity cross-section curvilinear average-of-roughness-height RZ. At the time of electroforming, it is, and it carries out, and is produced by coincidence, a joint-less flexibility endless-like member is used [ continuous ] as a base by invention of claim 5, and this joint-less flexibility endless-like member further the joint-less flexibility endless-like member indicated by above-mentioned claim 1 thru/or 3 by invention of claim 4 by invention of claim 6 It is characterized by being used as an object for conveyance. Invention according to claim 7 by forming a surface layer with a thickness [ with the granularity of a diffuse reflector condition ] of about 0.2-3 micrometers in the front face of the main stratum of an endless-like member Also when the use accompanied by deformation is repeated, while being able to prevent that endurance gets worse, also when it is used for an organic photo conductor, the belt for toner conveyance, etc., it aims at

offering the joint-less flexibility endless-like member which can fully demonstrate the function.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0011

[Method of Amendment] Modification

[Proposed Amendment]

[0011] Invention according to claim 8 aims at offering the manufacturing installation of the joint-less flexibility endless-like member which can form easily the surface layer of 0.2-0.8 micrometers of RZ on the surface of a main stratum by the surface roughness of 0.2-3 micrometers in thickness, and a diffuse reflector condition. Even when electrocasting liquid is supplied few in a cathode case, invention according to claim 9 The bubble which was made to overflow electrocasting liquid from up opening of this case, and was generated by Ayr bubbling can be made to flow out of cathode case up opening easily. While being able to prevent a bubble adhering to the upper limit part of an endless-like member, and soiling this endless-like member etc., it aims at offering the manufacturing installation of small [ which can lessen capacity of the feed pump of electrocasting liquid ], and a low cost joint-less flexibility endless-like member.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0012

[Method of Amendment] Modification

[Proposed Amendment]

[0012] Invention according to claim 10 for the purpose of invention according to claim 9 in addition, by making a diaphragm into double structure The electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated. The temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up. It aims at offering the manufacturing installation of a joint-less flexibility endless-like member which can fully secure the temperature of electrocasting liquid required to fabricate the surface layer of 0.2 to 0.8 micrometer RZ by the surface roughness of a diffuse reflection film condition.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0013

[Method of Amendment] Modification

[Proposed Amendment]

[0013] While invention according to claim 11 can supply electrocasting liquid toward up opening from the inner circumference lower limit section of a cathode case, making the temperature distribution of the electrocasting liquid supplied to the interior of a cathode case equalize It aims at offering the manufacturing installation of a joint-less flexibility endless-like member which it can dissociate [ manufacturing installation ] from electrocasting liquid and can make the bubble which was made to overflow electrocasting liquid from up opening of this case, and was generated by Ayr bubbling flow out easily out of a electrocasting tub.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0014

[Method of Amendment] Modification

[Proposed Amendment]

[0014]

[Means for Solving the Problem] In claim 1 thru/or invention of 3, rear-face granularity RZ1 and surface roughness RZ2 have the relation of RZ1<RZ2. Rear-face granularity RZ1 is [ the ten granularity cross-section curvilinear average of roughness height (RZ) ] 0.05-0.3 micrometers especially. And surface roughness RZ2 by the side of the front face of a member is the ten granularity cross-section curvilinear average of roughness height (RZ). Since it is 0.2-0.8 micrometers, and the activity which extracts a sleeve from a electrocasting master can be done smoothly and it is not accompanied by deformation of a sleeve, endurance is good. And at the time of electroforming, it is, and it carries out, and can produce to coincidence, and this joint-less flexibility endless-like member is equipped with the continuous features that the ease of sliding can be effectively used as a base or an object for conveyance as that process and application are specified as claim 4 thru/or 6. In the joint-less flexibility endless-like member which is fabricated by nickel amiosulfonate electrochemical molding and

used for the base of an organic photo conductor, the sleeve for development toner conveyance, etc. in order that invention according to claim 7 may solve the above-mentioned technical problem the surface roughness in 0.2-3 micrometers in thickness and the diffuse reflector condition that thickness was formed in the front face of the main stratum and main stratum of 20-40 micrometers, degrees of hardness 400-HV 500, and 0.05-0.3 micrometers of rear-face granularity RZ -- the surface layer of 0.2-0.8 micrometers of RZ -- since -- it is characterized by becoming.

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0015

[Method of Amendment] Modification

[Proposed Amendment]

[0015] Invention according to claim 8 is characterized by having the following. In order to solve the above-mentioned technical problem, it is the manufacturing installation of a flexible endless-like member according to claim 7, and it is an electroforming tub. The cylindrical master for electroforming by which it was extended and prepared in the vertical direction in this electroforming tub, and the minute concave convex was formed in the front face The cylindrical cathode case where have the diaphragm in which the energization which divides the inside of an electroforming tub into a positive-negative pole and \*\*\*\* are possible while being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, and opening was formed in the upper part, The adjustment device which adjusts the temperature of the supply means which can supply electrocasting liquid, an Ayr bubbling means to agitate with air the electrocasting liquid supplied in said cathode case, and the electrocasting liquid supplied in said cathode case toward the inner circumference lower limit section of this cathode case to up opening

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] 0016

[Method of Amendment] Modification

[Proposed Amendment]

[0016] In invention according to claim 8, said diaphragm is arranged in the perimeter of a cylindrical master by one-fold, and invention according to claim 9 is characterized by setting the permeability of this diaphragm as the JIS10.5-3cm<sup>3</sup>/second per cm<sup>2</sup>, in order to solve the above-mentioned technical problem. Invention according to claim 10 is characterized by setting the permeability of the diaphragm by which said diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\*\* duplex, and was arranged outside as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup> in invention according to claim 8, in order to solve the above-mentioned technical problem.

[Procedure amendment 9]

[Document to be Amended] Specification

[Item(s) to be Amended] 0017

[Method of Amendment] Modification

[Proposed Amendment]

[0017] In invention given in any they are, a dashboard is formed between said cathode cases and electroforming tubs. in order that invention according to claim 11 may solve the above-mentioned technical problem -- claims 8-10 -- this dashboard While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case. It is formed so that the periphery upper limit section of said electroforming tub may consist of up opening of a cathode case caudad about 5-15mm, and it is characterized by making it make electrocasting liquid flow out of this periphery upper limit section.

[Procedure amendment 10]

[Document to be Amended] Specification

[Item(s) to be Amended] 0018

[Method of Amendment] Modification

[Proposed Amendment]

[0018]

[Function] In claim 1 thru/or invention of 3, rear-face granularity RZ1 and surface roughness RZ2 of an endless-like member have the relation of RZ1<RZ2, especially, rear-face granularity RZ1 is 0.05-0.3

micrometers, and surface roughness RZ2 is 0.2-0.8 micrometers. moreover, the surface roughness in 0.2-3 micrometers in thickness and the diffuse reflector condition that the endless-like member was formed in the front face of the main stratum and main stratum of 20-40 micrometers, degrees of hardness 400-HV 500, and 0.05-0.3 micrometers of rear-face granularity RZ in thickness in invention according to claim 7 -- the surface layer of 0.2-0.8 micrometers of RZ -- since -- it is constituted. Therefore, also when the main stratum fabricated by nickel amiosulfonate electrochemical molding when an endless-like member was used as a member accompanied by repeat deformation of conveyance belts, organic photo conductors, etc., such as a copying machine, facsimile, or a printer, deforms the surface layer by which the use accompanied by deformation was formed on this main stratum 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum, endurance does not get worse.

[Procedure amendment 11]

[Document to be Amended] Specification

[Item(s) to be Amended] 0020

[Method of Amendment] Modification

[Proposed Amendment]

[0020] Furthermore, since surface area will be expanded when it has the surface roughness of 0.2-0.8 micrometers of RZ, since between a photo conductor and an electric conduction base is ohmic contact when applied to the image formation process of a photo conductor, are recording of rest potential can decrease and a clear image can be obtained. The cylindrical master for electroforming which is prepared in an electroforming tub and extends in the vertical direction in invention according to claim 8, While being isolated about 10-50mm with this master and being arranged in the perimeter of this master on the same axle, it has the diaphragm in which the energization which divides the inside of an electroforming tub into a positive-negative pole and \*\*\* are possible, and it has the adjustment device and \*\* which adjust the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cylindrical cathode case where opening was formed in the upper part, and a cathode case.

[Procedure amendment 12]

[Document to be Amended] Specification

[Item(s) to be Amended] 0021

[Method of Amendment] Modification

[Proposed Amendment]

[0021] Thus, if being constituted is in the approach of manufacturing the joint-less flexibility endless-like member used for the base of an organic photo conductor etc. by nickel amiosulfonate electrochemical molding, granularity is copied at the rear face and the rear-face granularity of the base usually becomes fine under the effect of the brightener for compressive-stress generating for releasing the deposit film from mold from an electroforming master (saccharin) etc. Therefore, it is for preventing becoming a glossy surface.

[Procedure amendment 13]

[Document to be Amended] Specification

[Item(s) to be Amended] 0023

[Method of Amendment] Modification

[Proposed Amendment]

[0023] In invention according to claim 9, a diaphragm is arranged in the perimeter of a cylindrical master by one-fold, and the permeability of this diaphragm is set as the JIS10.5-3cm<sup>3</sup>/second per cm<sup>2</sup>. Thus, for a cathode case, being constituted is from the lower limit section of a cylindrical master to the upper limit section about the electrocasting liquid supplied to the interior. It is because the permeability for performing moderate \*\*\*\* for distributing to homogeneity is required. Moreover, a bubble generates the inside of a cathode case with the surfactant in electrocasting liquid by carrying out Ayr bubbling. It is carried out, after this bubble was accumulated into the cathode case, and dispersed or has adhered to the cylindrical master upper part. In case a cylindrical master is washed, while this bubble will soil a penetrant remover, after floating to a penetrant remover, it is for preventing that the fault that will carry out the reattachment to a front face and a stain etc. will occur occurs.

[Procedure amendment 14]

[Document to be Amended] Specification

[Item(s) to be Amended] 0026

[Method of Amendment] Modification

## [Proposed Amendment]

[0026] In this invention, while being able to make it unnecessary to enlarge installed capacity of a rectifier by setting up in this way, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. In invention according to claim 10, the permeability of the diaphragm by which the diaphragm was arranged in the perimeter of a cylindrical master by the predetermined spacing \*\*\*\*\* duplex, and was arranged outside is set as the JIS15-10cm<sup>3</sup>/second per cm<sup>2</sup>.

## [Procedure amendment 15]

[Document to be Amended] Specification

[Item(s) to be Amended] 0027

[Method of Amendment] Modification

## [Proposed Amendment]

[0027] Therefore, the electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate the surface layer of 0.2-0.8 micrometers of RZ by the surface roughness of a diffuse reflection film condition can fully be secured. By invention according to claim 11, a dashboard is formed between a cathode case and an electroforming tub, and it is this dashboard, While being arranged so that the upper limit section may become the same height as up opening of a cathode case, the lower limit section is caudad arranged rather than the lower limit section of a cathode case, it is formed so that the periphery upper limit section of an electroforming tub may consist of up opening of a cathode case caudad about 5-15mm, and electrocasting liquid is flowed out of this periphery upper limit section.

## [Procedure amendment 16]

[Document to be Amended] Specification

[Item(s) to be Amended] 0029

[Method of Amendment] Modification

## [Proposed Amendment]

[0029] And since this activator has fizz, it foams so much at the time of churning for improving a flow of electrocasting liquid, and it will be in a wrap condition about a electrocasting oil level at it. And in order to supply air between a cylindrical master and a diaphragm in order to use a cylinder-like cathode case and to improve the liquid stirring effect at the time of electrocasting in this invention, and to agitate, for circulation only with the liquid with which the liquid in the tank besides a diaphragm passes a diaphragm, elevated-temperature liquid will pass a diaphragm, and will go up, and great time amount will be taken for the temperature distribution in a tub to equalize.

## [Procedure amendment 17]

[Document to be Amended] Specification

[Item(s) to be Amended] 0030

[Method of Amendment] Modification

## [Proposed Amendment]

[0030] And in order that the ununiformity of these temperature distribution may prevent the current which goes to cathode from an anode plate, various faults, such as being hard coming to release an endless-like member from mold, will be started from the concentration or the cylindrical master of a current to reduction in compressive stress, ununiformity-izing of thickness distribution, and the edge of a cylindrical master on the electrocrystallization film. Since it is such, in order to use a cathode case efficiently, in invention, it is necessary for the flow of the electrocasting liquid supplied in the electroforming tub to be able to make the start of the temperature in an electroforming tub prompt, without starting the ununiformity of temperature distribution, and to make a lot of bubbles generated with the surface active agent further added by electrocasting liquid at the time of Ayr bubbling flow out smoothly.

## [Procedure amendment 18]

[Document to be Amended] Specification

[Item(s) to be Amended] 0031

[Method of Amendment] Modification

## [Proposed Amendment]

[0031] Therefore, the thing for which the periphery upper limit section of an electroforming tub is formed so that it may consist of up opening of a cathode case caudad about 5-15mm while forming the diaphragm

mentioned above in this invention, All can be mostly dropped toward the lower limit section of a dashboard, and this liquid that descended can be made to flow out of the periphery section upper limit of the electrocasting liquid which passed the electrocasting liquid and the diaphragm which passed through the inside of a cathode case and were overflowed from the upper limit section of this case which is an electroforming tub easily.

[Procedure amendment 19]

[Document to be Amended] Specification

[Item(s) to be Amended] 0032

[Method of Amendment] Modification

[Proposed Amendment]

[0032] Consequently, while being able to prevent that the flow of the electrocasting liquid supplied in the electroforming tub starts the ununiformity of temperature distribution, the start of the temperature in an electroforming tub can be made prompt. Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard top can be made to be able to overflow and it can be made to flow out of the periphery upper limit of an electroforming tub outside smoothly.

[Procedure amendment 20]

[Document to be Amended] Specification

[Item(s) to be Amended] 0037

[Method of Amendment] Modification

[Proposed Amendment]

[0037] For this reason, as for the optical carrier generating layer 4 or the under-coating layer 3, it is desirable to make it thin as much as possible according to a process, a part of laser beam (an arrow head L shows) in which the latent image was formed penetrates the optical carrier generating layer 4 and the under-coating layer 3, it reaches a base 2, and they reflect it. Since the under-coating layer 3 is penetrated again, resorption is carried out with the rear face of the optical carrier generating layer 4 and fault pattern [ an interference fringe, a multiple echo pattern, etc. ] image formation is made, this reflected light makes the under-coating layer 3 distribute titanium oxide impalpable powder, alumina impalpable powder, etc. as a light-scattering agent.

[Procedure amendment 21]

[Document to be Amended] Specification

[Item(s) to be Amended] 0041

[Method of Amendment] Modification

[Proposed Amendment]

[0041] thus, the transmitted light mentioned above when constituted -- again -- dispersion -- effective -- it can act . Drawing 4 and 5 are drawings showing the equipment which manufactures the base 2 mentioned above. First, a configuration is explained. In drawing 4, 11 is an electroforming tub (only henceforth a electrocasting tub), and the titanium case 12 by the side of an anode plate is established in this electrocasting tub 11.

Moreover, in the electrocasting tub 11, the cylindrical master 13 for electroforming for carrying out electrocrystallization of the nickel belt is formed, this cylindrical master 13 extends in the vertical direction, and while the end section of rod 13a is attached in the upper limit section, the minute concave convex is formed in the front face.

[Procedure amendment 22]

[Document to be Amended] Specification

[Item(s) to be Amended] 0043

[Method of Amendment] Modification

[Proposed Amendment]

[0043] Moreover, the cathode case 16 by the side of cathode is arranged in the perimeter of the cylindrical master 13, and this cathode case 16 is prepared in the interior of the titanium case 12 while it is isolated about 10-50mm with the cylindrical master 13 and is arranged in the perimeter of this master on the same axle. This cathode case 16 is constituted as shown in drawing 5. In drawing 5, 17 is the lower limit flange 17 attached in the electrocasting tub 11, and the inhalant canal mentioned later is connected to this lower limit flange 17. The case frame 18 is formed on this lower limit flange 17, and the object for the outflow of electrocasting liquid and opening 18a for energization are formed in the upper part of this case frame 18. Moreover, this case frame 18 is supporting two or more diaphragms 19 which consist of cloth, such as polypropylene or vinyl chloride, this diaphragm 19 is isolated about 10-50mm with the cylindrical master 13, and is prepared in the perimeter of this master 13 one-fold, and a batch requires the cylindrical master 13 from a perimeter.

[Procedure amendment 23]

[Document to be Amended] Specification

[Item(s) to be Amended] 0044

[Method of Amendment] Modification

[Proposed Amendment]

[0044] Moreover, while the upper part is being fixed to the case frame 18 by the annular clamping flange 20, that permeability is set per [ 0 ] JIS1cm<sup>2</sup> and as a 5-3cm<sup>3</sup>/second, and when electrocasting liquid is supplied between the cylindrical masters 13, this diaphragm 19 is constituted so that this electrocasting liquid may be made to overflow from a clamping flange 20. Moreover, the air blow-off member 21 is formed in the lower limit side of the case frame 18, this blow-off member 21 is connected to the air supply 25 through the filter 22, the pressure reducer 23, and the bulb 24, and the electrocasting liquid supplied between a diaphragm 19 and the cylindrical master 13 is agitated by supplying the air from the air supply 25 decompressed by the pressure reducer 23 between a diaphragm 19 and the cylindrical master 13. And this air blow-off member 21, the filter 22, the pressure reducer 23, the bulb 24, and the air supply 25 constitute the Ayr bubbling means 58.

[Procedure amendment 24]

[Document to be Amended] Specification

[Item(s) to be Amended] 0045

[Method of Amendment] Modification

[Proposed Amendment]

[0045] Moreover, the inhalant canal 31 is connected to the lower limit flange 17, and this inhalant canal 31 is connected to the pump 32. This pump 32 is connected to the 1st stock tub 34 by which sulfamic acid nickel-electroforming liquid was stocked through the bulb 33. While the electrocasting liquid which flowed into this stock \*\* 34 out of the electrocasting tub 11 through the excurrent canal 35 flows back and cooling this reflux with a cooling pipe 36, electrocasting liquid is kept warm at a heater 37 so that it may become 50-60 degrees C.

[Procedure amendment 25]

[Document to be Amended] Specification

[Item(s) to be Amended] 0046

[Method of Amendment] Modification

[Proposed Amendment]

[0046] Moreover, this pump 32 is connected to the 2nd stock tub 39 by which sulfamic acid nickel-electroforming liquid was stocked through the bulb 38. While the electrocasting liquid from the 1st stock tub 34 is supplied to this stock tub 34 through a pump 40 and cooling this electrocasting liquid with a cooling pipe 41, electrocasting liquid is kept warm at a heater 42 so that it may become 30-40 degrees C.

[Procedure amendment 26]

[Document to be Amended] Specification

[Item(s) to be Amended] 0047

[Method of Amendment] Modification

[Proposed Amendment]

[0047] Therefore, a pump 32 supplies the electrocasting liquid of different temperature stocked by the 1st stock tub 34 or the 2nd stock tub 39 switched by the bulb 33 or the bulb 38 between a diaphragm 19 and the cylindrical master 13 from the lower limit flange 17 (inner circumference lower limit section of a cathode case). These inhalant canals 31, a pump 32, a bulb 33, the 1st stock tub 34, a cooling pipe 36, a heater 37, a bulb 38, the 2nd stock tub 39, a cooling pipe 41, and a heater 42 are the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cathode case 16. Constituting the adjustment device 59 to adjust, an inhalant canal 31, a pump 32, the bulb 33, the 1st stock tub 34, the bulb 38, and the 2nd stock tub 39 constitute the supply means 60 which can supply electrocasting liquid toward up opening from the inner circumference lower limit section of the cathode case 16.

[Procedure amendment 27]

[Document to be Amended] Specification

[Item(s) to be Amended] 0048

[Method of Amendment] Modification

[Proposed Amendment]

[0048] On the other hand, the dashboard 44 is formed between the cathode case 16 and the electrocasting tub 11, and while the upper limit section of this dashboard 44 is arranged so that it may become the same height as

the fixed flange 20 (up opening) of the cathode case 16, the lower limit section is caudad arranged rather than the lower limit section of the cathode case 16. Moreover, it is constituted so that it may \*\*\*\* in the location where it is constituted in so that the slide member 45 may be formed in the periphery upper limit section of the electrocasting tub 11 and this slide member 45 may move in the vertical direction along with the electrocasting tub 11, and the upper limit section consists of a fixed flange 20 of the cathode case 16 caudad about 5-15mm, and may be fixed to the electrocasting tub 11 by 46 and the electrocasting liquid from the upper limit section may be flowed out.

[Procedure amendment 28]

[Document to be Amended] Specification

[Item(s) to be Amended] 0049

[Method of Amendment] Modification

[Proposed Amendment]

[0049] Next, how to manufacture a base 2 by such manufacturing installation is explained. First, while supplying the electrocasting liquid which opened the bulb 33 wide, was stocked by the 1st stock tub 34 between the diaphragm 19 and the cylindrical master 13 from the inhalant canal 31 through the pump 32, and was adjusted to the temperature of 50-60 degrees C, air is supplied by part for the air blow-off tubing 21-5 - 10L, and electrocasting liquid is agitated.

[Procedure amendment 29]

[Document to be Amended] Specification

[Item(s) to be Amended] 0050

[Method of Amendment] Modification

[Proposed Amendment]

[0050] Moreover, 20-40 micrometers, degrees of hardness 400-HV 500, rear-face granularity RZ 0.05-0, and the 3-micrometer main stratum 6 are formed in the front face of the cylindrical master 13 in thickness by setting up the electrocrystallization current at this time as 5 - 10 A/dm<sup>2</sup>, and setting up electrocrystallization time amount in 10 - 30 minutes. Since the rate of flow of electrocasting liquid becomes that electrocasting liquid is agitated by air and coincidence early at this time, neither a pit nor desperation occurs in a main stratum 6.

[Procedure amendment 30]

[Document to be Amended] Specification

[Item(s) to be Amended] 0051

[Method of Amendment] Modification

[Proposed Amendment]

[0051] Subsequently, while carrying out adjustable [ of the electrocrystallization current ] to 0, 1 - 1 A/dm<sup>2</sup>, the electrocasting liquid which was stocked by the 2nd stock tub 39 between the diaphragm 19 and the cylindrical master 13 from the inhalant canal 31 through the pump 32, and was adjusted to the temperature of 30-40 degrees C is supplied by closing a bulb 33 and opening a bulb 38. At this time, if the skin temperature of the cylindrical master 13 will be in this electrocasting temperature and equilibrium, the surface layer 7 of 0.2-0.8 micrometers of RZ will be formed in the front face of a main stratum 6 by the surface roughness of 0.2-3 micrometers in thickness, and a diffuse reflector condition by carrying out adjustable [ of the electrocrystallization current ] to 5 - 10 A/dm<sup>2</sup>.

[Procedure amendment 31]

[Document to be Amended] Specification

[Item(s) to be Amended] 0055

[Method of Amendment] Modification

[Proposed Amendment]

[0055] Furthermore, in the image formation process of a photo conductor, since front-face nature will be expanded when it has the surface roughness of 0.2-0.8 micrometers of RZ, since between a photo conductor and the conductive base 2 is ohmic contact, are recording of rest potential can decrease and a clear image can be obtained. Moreover, in case the minute concave convex formed in the front face of the cylindrical master 13 when the electrocrystallization film was deposited to the cylindrical master 13 is copied at the rear face of a main stratum 6, under the effect of the brightener for compressive-stress generating for releasing the deposit film from mold from a \*\*\*\*\* master (saccharin) etc., the granularity of the front face becomes fine and serves as a glossy surface.

[Procedure amendment 32]

[Document to be Amended] Specification

[Item(s) to be Amended] 0056

[Method of Amendment] Modification

[Proposed Amendment]

[0056] While being isolated about 10-50mm with the cylindrical master 13 and being arranged in the perimeter of this master 13 on the same axle in this example While establishing the cathode case 16 where have the diaphragm 18 in which the energization which divides the inside of the electrocasting tub 11 into a positive-negative pole and \*\*\* are possible, and opening 18a was formed in the upper part Since the adjustment device 59 which adjusts the temperature of the electrocasting liquid supplied to the inner circumference lower limit section of the cathode case 16 is formed, The solution temperature of the range of 10-50mm around the cylindrical master 16 can be easily adjusted to predetermined temperature. The surface layer of the diffuse reflection film condition of 0.2-0.8 micrometers of surface roughness RZ can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding, without reducing solution temperature and changing the component of electrocasting liquid.

[Procedure amendment 33]

[Document to be Amended] Specification

[Item(s) to be Amended] 0060

[Method of Amendment] Modification

[Proposed Amendment]

[0060] Therefore, while being able to make it unnecessary to make a power surge into about 0.3-0.5V, and to enlarge installed capacity of the rectifier by setting up in this way, pump capacity can be lessened and low-costizing and a miniaturization of a manufacturing installation can be attained. While a dashboard 44 is formed between the cathode case 16 and the electrocasting tub 11, and, arranging the upper limit section of this dashboard 44 on the other hand so that it may become the same height as up opening of the cathode case 16 The lower limit section is caudad arranged rather than the lower limit section of the cathode case 16, a slide member 45 is formed so that the periphery upper limit section of the electrocasting tub 11 may consist of up opening of the cathode case 16 caudad about 5-15mm, and electrocasting liquid is made to flow out of this slide member 45.

[Procedure amendment 34]

[Document to be Amended] Specification

[Item(s) to be Amended] 0062

[Method of Amendment] Modification

[Proposed Amendment]

[0062] In order to supply air between the cylindrical master 16 and a diaphragm 19 in order to use the cylinder-like cathode case 16 and to improve the liquid stirring effect at the time of electrocasting in this example, and to agitate, for circulation only with the liquid with which the liquid in the tank besides a diaphragm 19 passes a diaphragm, elevated-temperature liquid will pass a diaphragm 19, and will go up, and great time amount will be taken for the temperature distribution in a tub to equalize.

[Procedure amendment 35]

[Document to be Amended] Specification

[Item(s) to be Amended] 0063

[Method of Amendment] Modification

[Proposed Amendment]

[0063] And in order that the ununiformity of these temperature distribution may prevent the current which goes to cathode from an anode plate, various faults, such as being hard coming to release an endless-like member from mold, will be started from the concentration or the cylindrical master of a current to reduction in compressive stress, ununiformity-izing of thickness distribution, and the edge of the cylindrical master 13 on the electrocrystallization film. In order to prevent that such fault occurs and to use the cathode case 16 efficiently in this example, the flow of the electrocasting liquid supplied in the electrocasting tub 11 could make prompt the start of the temperature in the electrocasting tub 11, without starting the ununiformity of temperature distribution, and in order to make a lot of bubbles generated with the surface active agent added by electrocasting liquid at the time of Ayr bubbling flow out smoothly, the dashboard 44 which takes the arrangement condition mentioned above has formed further. For this reason, the electrocasting liquid which passed the electrocasting liquid and the diaphragm 19 which passed through the inside of the cathode case 16,

and were overflowed from the upper limit section of this case 16 will descend toward the lower limit section of a dashboard 44 altogether, and this liquid that descended flows out of slide member 45 upper limit of the electrocasting tub 11 easily. And the liquid which flowed out outside flows back the 1st stock layer 34 through an excurrent canal 35.

[Procedure amendment 36]

[Document to be Amended] Specification

[Item(s) to be Amended] 0064

[Method of Amendment] Modification

[Proposed Amendment]

[0064] Consequently, the time when it can prevent that the flow of the electrocasting liquid supplied in the electrocasting tub 11 starts the ununiformity of temperature distribution can make prompt the start of the temperature in the electrocasting tub 11. Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard 44 top can be made to be able to overflow and it can be made to flow out of slide member 45 upper limit outside smoothly.

[Procedure amendment 37]

[Document to be Amended] Specification

[Item(s) to be Amended] 0066

[Method of Amendment] Modification

[Proposed Amendment]

[0066] Moreover, in this permeability, since it is rare to cover to an electrocrystallization current, and power surges are few or it is 0 and less than [ 1V ], it does not come to enlarge installed capacity of a rectifier. Moreover, in this example, although the endless-like member is applied to the joint-less flexibility nickel belt of an organic photo conductor, as shown not only in this but in drawing 7, you may apply to the nickel sleeve 54 of the roller for development toner conveyance.

[Procedure amendment 38]

[Document to be Amended] Specification

[Item(s) to be Amended] 0070

[Method of Amendment] Modification

[Proposed Amendment]

[0070]

[Effect of the Invention] When using an endless-like member as a member accompanied by repeat deformation of conveyance belts, organic photo conductors, etc., such as a copying machine, facsimile, or a printer, according to invention according to claim 7; it is SURUFAMIRE acid nickel electrochemical molding. Also when the fabricated main stratum deforms the surface layer by which the use accompanied by deformation was formed on this main stratum 30,000 times since the crookedness condition had 100,000 times or more of endurance further with a main stratum, endurance does not get worse.

[Procedure amendment 39]

[Document to be Amended] Specification

[Item(s) to be Amended] 0072

[Method of Amendment] Modification

[Proposed Amendment]

[0072] Furthermore, in the image formation process of a photo conductor, since front-face nature will be expanded when it has the surface roughness of 0.2-0.8 micrometers of RZ, since between a photo conductor and an electric conduction base is ohmic contact, are recording of rest potential can decrease and a clear image can be obtained. According to invention according to claim 8, the solution temperature of the range of 10-50mm around the cylindrical master 16 can be easily adjusted to predetermined temperature, and the surface layer of the diffuse reflector condition of 0.2-0.8 micrometers of surface roughness RZ can be deposited succeeding the main stratum of the degrees of hardness 400-HV 500 obtained by nickel amiosulfonate electrochemical molding, without reducing solution temperature and changing the component of electrocasting liquid.

[Procedure amendment 40]

[Document to be Amended] Specification

[Item(s) to be Amended] 0073

[Method of Amendment] Modification

[Proposed Amendment]

[0073] Moreover, since an Ayr bubbling means to agitate with air the electrocasting liquid supplied in a supply means to supply electrocasting liquid toward the upper limit section from the lower limit section of a cathode case, and a cathode case is established, the temperature of the electrocasting liquid supplied in a cathode case can be equalized, and the surface roughness of a surface layer can be equalized easily. Even if electrocasting liquid is a low flow rate (a part for for example, 5 - 20L/), electrocasting liquid can be made to be able to overflow from the upper limit section of a cathode case, and the bubble generated by air bubbling can be made to flow out of the upper limit section of a cathode case easily, while being able to distribute the volume supplied in a cathode case to homogeneity from the lower limit section of a cylindrical master to the upper limit section according to invention according to claim 9. Moreover, while pressing down the power surge to the electrocrystallization current by the diaphragm to about 0.5V, the amount of electrocasting liquid dipping at the time of electrocrystallization can be reduced.

[Procedure amendment 41]

[Document to be Amended] Specification

[Item(s) to be Amended] 0074

[Method of Amendment] Modification

[Proposed Amendment]

[0074] Consequently, while being able to make it unnecessary to enlarge installed capacity of a rectifier, pump capacity can be lessened and low-cost-izing and a miniaturization of a manufacturing installation can be attained. According to invention according to claim 10, the electrocasting liquid supplied to the inner circumference section of an inside diaphragm and the electrocasting liquid besides an outside diaphragm are separated, the temperature of the electrocasting liquid supplied to the inner circumference section of an inside diaphragm can be prevented from pulling up, and the temperature of electrocasting liquid required to fabricate the surface layer of 0.2-0.8 micrometers of RZ by the surface roughness of a diffuse reflector condition can fully be secured.

[Procedure amendment 42]

[Document to be Amended] Specification

[Item(s) to be Amended] 0075

[Method of Amendment] Modification

[Proposed Amendment]

[0075] According to invention according to claim 11, all the electrocasting liquid that passed the electrocasting liquid and the diaphragm which passed through the inside of a cathode case and were overflowed from the upper limit section of this case can be dropped toward the lower limit section of a dashboard, and this liquid that descended can be made to flow out of the periphery section upper limit of an electroforming tub easily. Consequently, while being able to prevent that the flow of the electrocasting liquid supplied in the electroforming tub starts the ununiformity of temperature distribution, the start of the temperature in an electroforming tub can be made prompt.

[Procedure amendment 43]

[Document to be Amended] Specification

[Item(s) to be Amended] 0076

[Method of Amendment] Modification

[Proposed Amendment]

[0076] Moreover, after making the bubble generated by Ayr bubbling separate with electrocasting liquid, a dashboard top can be made to be able to overflow and it can be made to flow out of the periphery upper limit of an electroforming tub outside smoothly.

[Procedure amendment 44]

[Document to be Amended] Specification

[Item(s) to be Amended] Explanation of a sign

[Method of Amendment] Modification

[Proposed Amendment]

[Description of Notations]

2 Base (Endless-like Member)

6 55 Main stratum

7 56 Surface layer

11 Electrocasting Tub

13 Cylindrical Master  
16 Cathode Case  
19, 51, 52 Diaphragm  
44 Dashboard  
54 Sleeve (Endless-like Member)  
58 Ayr Bubbling Means  
59 Adjustment Device  
60 Supply Means

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[Translation done.]

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